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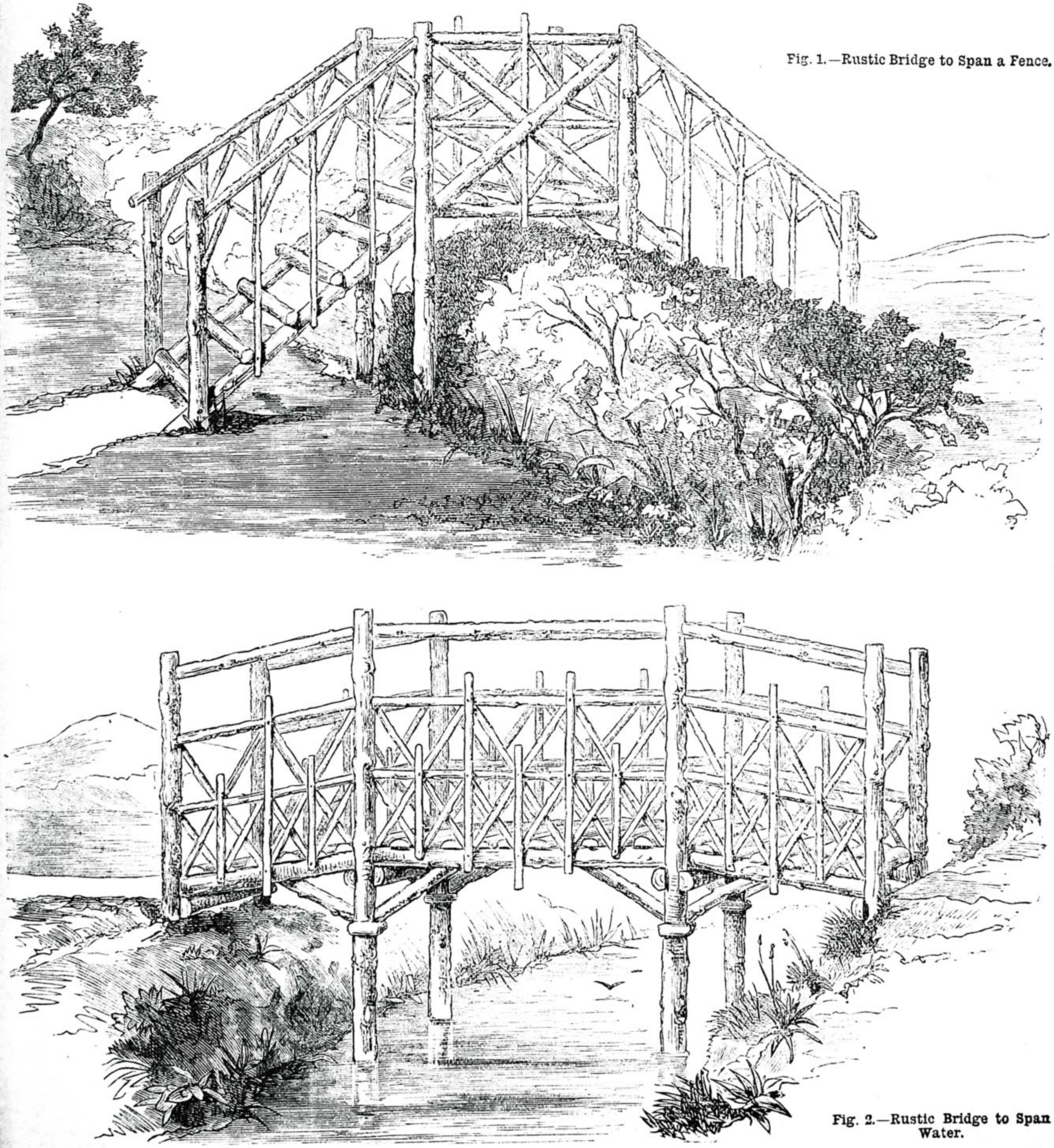

Fig. 1.—Rustic Bridge to Span a Fence.

Fig. 2.—Rustic Bridge to Span Water.

TWO RUSTIC BRIDGES FOR THE GARDEN.

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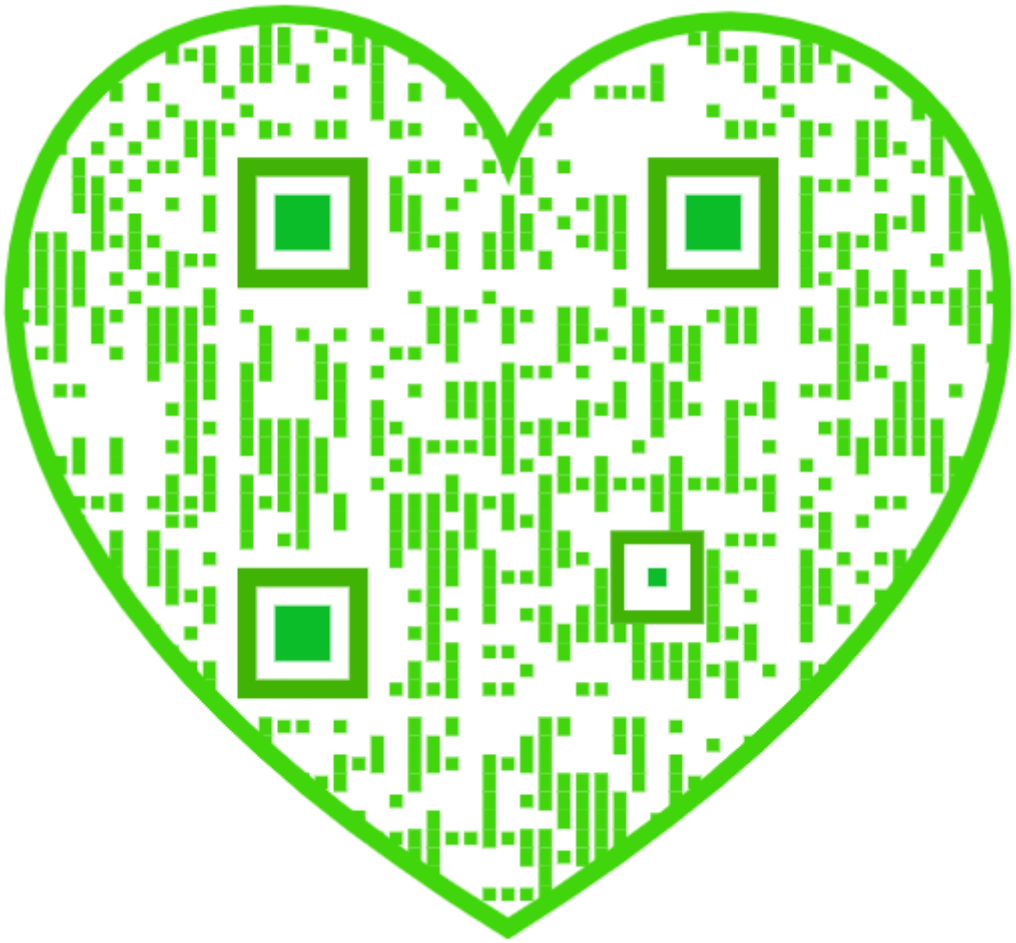

TWO RUSTIC BRIDGES FOR THE GARDEN.

BY ARTHUR YORKE.

THE RUSTIC BRIDGE AS A MEANS OF CROSSING A FENCE—REASONS FOR ADOPTING IT—CONSTRUCTION OF SUCH A BRIDGE—RUSTIC BRIDGES TO CROSS WATER—A WORD ON THE INTRODUCTION OF WATER AS A FEATURE IN GARDENS—AN INSTANCE—CONSTRUCTION OF THE BRIDGE GIVEN IN THE DESIGN.

RUSTIC bridges can scarcely be introduced as things necessary to the completeness of every garden. It is not through every suburban plot that a river or even a trout brook can be made to flow. The reader will, however, observe that one of the designs given is intended for bridging dry land only, and those to whom this may be useful or suggestive will be many in number. This bridge, though not exactly like the step-stiles with which one meets in a country ramble, might perhaps, instead, not improperly be called a step-stile. It is, as shown in Fig. 1, for crossing a quick-set hedge or other fence. As a means of entrance to, and of exit from, a garden, it would scarcely be suited for general traffic; it is rather for use where merely an occasional way, and at the same time an ornamental object, are desired. Apart from picturesqueness, it has certain advantages over a gate. No gap needs to be cut for it; it does not injure the fence, nor will stray animals avail themselves of it, as of an unfastened gate, for giving the gardener their unwelcome company, for no four-footed creature less active than a cat would be able to cross it.

The illustration given of it in Fig. 1 is in perspective, since being by no means a familiar structure in rustic work, it might otherwise have been difficult to realise its appearance; whilst its construction is so simple and so easily seen as to need no further diagrams. Two pairs of side timbers set, as a herald would say, "chevron-wise," and strengthened by two pairs of upright posts, are placed a convenient distance apart—in the illustration about 2 ft. 6 in. These are connected by the steps which are nailed or pegged into notches cut in them. A handrail connected with a very little ornamental rustic work is added. The bridge in the illustration is shown as spanning quite a low clipped hedge, but were the fence a more formidable one and the four posts consequently higher, it might perhaps be well to strengthen them with an additional tie in the shape of diagonal braces connecting each pair just below the steps.

A more simple bridge of this kind may be made without posts—those for the handrails only excepted—by placing the side-timbers more like an inverted V, the topmost step resting upon its apex, and with another inverted V as a handrail. Such an arrangement would require less material and less labour, but it would be more steep and more difficult to climb than that before us. The steps in Fig. 1 are, it will be observed, as easy of ascent as an ordinary staircase, whilst the little landing or platform on the summit, which is wanting in the V-shaped bridge, constitutes a pleasing feature. The steps here being pretty closely laid, it is no bad place in which to loiter for awhile.

The design, Fig. 2, is for an ordinary bridge to span water. Fewer persons, perhaps, will need to make use of it than of the last; yet there are gardens in which something of the kind might be used advantageously. Where water can be introduced in a garden, it may always under tasteful management be made a pleasing feature. Some time since, an acquaintance of the writer undertook the highly unpromising task of turning into a garden a portion of a disused brick field which lay near his house. Anything more hopelessly ugly than the clay pit which he took in hand, with its bare bluish banks and its pool of stagnant water at bottom, it would be hard to imagine. His friends laughed at him; but he went quietly to work. Some portion of the pool he filled up so as to make it into a long, irregular piece of water. At one end, and a little above its level, he built a summer-house. He planted his bare banks with our native, hardy English shrubs. of which he got together an interesting collection, and than some of which, as instance the furze and broom, nothing could be more lovely in their season. Over banks where nothing else could be made to grow he trained ivy. The edges of his pond he filled with aquatic plants, in the beauty of which you forgot that it was stagnant water only in which they grew. His paths, which sometimes wound along the high banks and sometimes skirted the pond, were in two places carried over narrow parts of the water on rustic bridges, so placed as to show most effectively from the summer-house; and these being like our present design rendered as ornamental as might be, formed no mean part of the attractiveness of his little paradise. Thus with some outlay, it must be admitted, of taste and labour, he made a most pleasant retreat of a spot otherwise valueless and a mere eyesore. This is mentioned to show how objects like the present design may be utilised to good purpose.

As to the particular bridge in the illustration, although it has been drawn in perspective, the side nearest the spectator may be considered as an elevation to scale ($\frac{1}{2}$ in. to the foot), and it is shown as spanning a water some 5 ft. broad. Such a breadth might, of course, readily be crossed by a bridge of which the side-timbers were merely two straight pieces. But in matters of this nature, appearance is of almost more importance than use, and it would not be possible to render a straight bridge so picturesque as one in which, as in the illustration, the centre is higher than the ends—the gain is worth the extra material and trouble.

The weight is chiefly borne on four main pillars, of which two appear. Each pair of these is supposed to be set about 3 ft. apart, which gives a good width of way for ordinary purposes; the two pairs of shorter posts at the ends have but little strain upon them. Each pair of posts is connected by a cross-piece or pieces, of which the ends only show in the figure. On these cross-pieces rest the side-timbers, to which are nailed the treads of the bridges. These latter are shown to be of half-round stuff, nailed some little space apart; these will wear longer than planks, as water will not lie on them, and in appearance are vastly superior. The handrail is about a yard above the treads, that being a convenient height to lean upon.

For building either of these bridges, no other wood will in any way be found equal to larch.

It is not every one, assuredly, who will be able to find either room or requirement for a bridge in his garden or on the ground that surrounds his house; but it must be remembered that parts of the designs, and especially of Fig. 1, may be utilised and adapted to form means of access to entrances and places above the ground level, or, in other words, to supply a picturesque set of steps or stairs.

MECHANICAL PROBLEMS.

BY FRANCIS CAMPIN, C.E.

EVEN as there is a period for big gooseberries, and for the newspaper discussion of unusual and sentimental topics, problems of a supposed equivocal character are put forward for the mental exercise of a certain portion of the curious public. From the fact that different solutions of the same problem are submitted for acceptance, the conclusion must be drawn that some of the solvers have only confused ideas of some very elementary principles.

All kinds of work, every form of motion, the strength and stability of matter, all terrestrial phenomena, exist in accordance with certain mechanical laws, unalterable in their nature and continuous in their action; and if we give a little thought to the primary principles upon which these laws rest, our labour will be repaid by the acquirement of a distinct perception of what can and what cannot be brought about by any given mechanical means; this clear first notion the student must not allow to be clouded by any subsequent complications built upon it, and if at any time in doubt, by reason of the complexity of a machine, let him consider what takes place at each end, according to his own calculations, and see how that accords with primary laws, which can never be varied by any mechanical arrangement whatever.

The first law to receive is that the total quantity of force or energy is constant; it cannot be increased or diminished in quantity, although its form may be altered. It is this law which precludes the possibility of perpetual motion machines. In the sense of machines that shall create power, perpetual motion at a constant velocity may be conceived to exist as motion simply, no work being done; but as in the motion of every machine there are frictional resistances to be overcome, mechanical perpetual motion is impossible, and it may further be remarked that if it were possible it would be useless, as mere movement unaccompanied by a delivery of power can effect nothing. "From nothing, nothing comes," is, in one form or other, one of the oldest dogmas of philosophy, and to the disregard of it has been due the immeasurable waste of time and money, brought about by the perpetual motion infatuation. As an instance of how obstinately dull even an educated man once absorbed in this study may become, I will mention one of many that came within my own knowledge some years ago, and it is only one of a very common type. This inventor required the assistance of an expert in perfecting the "mechanical details" of his machine. "The machine was a success; it worked all right, but there was a *little hitch to be overcome* at one part of the revolution." The italics are mine. The overcoming of that "little hitch" simply meant imparting sufficient power to the machine to enable it to overcome the frictional resistances of the next revolution; yet the inventor could not be brought to see it, and so sacrificed a hard-earned fortune and the latter years of his life to this fancy.

If a single force acts upon a body, motion must ensue; and also if two forces act upon it, unless they are exactly equal in intensity and opposite in direction, when the body will be held at rest, and the general law is that for a body to be at rest any forces acting upon it in one direction taken together must be balanced by other

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forces together equal to them, acting in an opposite direction. Now let us get rid of an elementary misapprehension, which arises more from a mode of speech than anything else, which is that any body exists at any time unacted upon by any force. If a ball lies at rest upon a table, two forces are acting upon it to keep it in position : first the force of gravity to draw it vertically downwards ; second the cohesive elastic resistance of the material of the table acting vertically upwards. When the ball is placed upon the table the latter bends (although not sufficiently to be visible to the unassisted sight) until its upward resistance is equal to the weight of the ball.

This action can be more clearly shown by placing the ball upon a flexible spring, the deflection of which will be plainly visible. Two laws have now been set forth : first, that the total quantity of energy in existence in all forms is constant ; and second, that if forces are acting upon a point at rest, the action and reaction must be equal, and in opposite directions. Now let us turn to the effects produced by unbalanced and partly balanced forces.

The value of a force is measured by the velocity it will impart, when unresisted, to a body in a given time ; thus the attraction of gravitation will in one second impart to a falling body a velocity of 32$\frac{1}{5}$ feet, if the body is falling freely, and by comparison with this other forces, such as centrifugal, can be measured. At the end of two seconds the velocity will be doubled, and so on ; from this we can easily calculate the velocity any freely falling body will acquire in a given time. One use of this will be seen further on.

When "work" is spoken of, a resistance, overcome through some distance, is inferred, and it is usual to speak of it as pounds pressure, exerted through a given number of feet ; thus, if a truck is pushed 100 feet by a steady pressure of 80 lbs. against it, the quantity of work done is 100 feet multiplied by 80 lbs., equal to 8,000 ft.-lbs. If a weight is lifted vertically, the work done in lifting it is equal to the amount of the weight multiplied by the height to which it is lifted ; if the weight so lifted is allowed to fall against a resistance, it is capable of doing the same amount of work in its descent as was done upon it in lifting it, and if it falls unopposed, this amount of work will at the end of its fall be accumulated or stored in it, and instead of coming to rest it will have a certain velocity, calculable as shown above. All moving bodies have energy or work accumulated in them, in proportion to the velocity of motion, no matter what direction the motion takes, and the amount of such work is equal to the weight of the body multiplied the height it would require to fall to attain such velocity. The falling body starts from a state of rest, so its mean velocity would be half the final velocity, and this multiplied by the necessary time of fall will give the required height. The time of fall is found by dividing the final velocity by 32$\frac{1}{5}$. This may be illustrated by the case of a train assumed to weigh 120 tons and travelling at a rate of 40 miles an hour. There are 5,280 feet in a mile, and 3,600 seconds in an hour, so the velocity in feet per second will be 40 multiplied by 5,280 and divided by 3,600, which equals 58$\frac{2}{3}$; dividing by 32$\frac{1}{5}$, we find time of fall 1$\frac{11}{30}$ seconds ; multiplying this by the mean —that is half the final—velocity, 29$\frac{1}{3}$, we have the height of fall, 53$\frac{1}{2}$ feet, as that corresponding to the velocity of the train.

The train weighs 120 tons, or 268,800 lbs., which multiplied by the calculated fall gives 14,380,800 ft.-lbs as the amount of work accumulated in the train. It must be clearly understood that it does not matter from what source the work is transmitted—gravity, steam, electricity, or any other—the accumulated work depends solely upon the velocity and weight of the body under consideration, and, simplifying the above method—which I have used to make the reasoning clear—will be found by multiplying the weight in pounds by the square of the velocity in feet per second, and dividing the result by 64$\frac{3}{5}$. As no energy can be destroyed, this accumulated work must be transformed into some other form of force in order to stop the train. If the steam is shut off and the train allowed to run until it comes to rest, the stored work will be expended on friction of axles and air resistance, and be converted into heat ; and if brakes are applied it also will be converted into heat if the train is running on a level ; if the train is running up hill, part of the accumulated work is spent in raising it ; if running down, the gravitation of the train is adding to the stored energy, and this addition must also be converted before the train is brought to rest. We can thus trace the heat given off by the coal in the boiler furnace through its first change into motion of a solid body, back to its re-conversion into heat, which passes away to cause the growth of plants and trees, that may in distant ages again appear as coal, and thus complete the cycle of changes.

There is in this matter another point to be considered, which I have never seen explained in text-books or elementary articles on mechanical matters, and which, therefore, to complete the illustration, I shall here deal with ; for although it does not affect the practical working, yet its study will help to clear away such cobwebs as obscure the fancy problems mentioned at the commencement of this article. We know from daily experience that if we wish to put a body in motion we must have some abutment from which to work. We press our feet against the ground at an angle to get thrust against a truck ; the explosive which drives a ball from a gun presses equally against the breech, causing the recoil ; and generally the propelling force acts between two bodies, and the greater velocity is imparted to the lighter mass, in the ratio of the weights and other resistances of the masses. If one surface were absolutely fixed, the whole motion would be applied to the other ; but there is nothing absolutely fixed, not even the earth itself, which is both moving through space and revolving upon its axis. Now, in respect of two forces acting upon one body, it does not matter what disproportion there is between them, the less must modify or increase the larger, according to its direction and intensity. If one drop of rain falls into the Pacific Ocean, there is that quantity of water added, although we cannot discern it, and the slightest change of force cannot occur without producing an effect—small, inappreciable by our senses perhaps, but still, produced.

Now, when the brakes are applied to a rapidly moving train, there is a very considerable pull upon the rails, and this pull must be transmitted to the earth, and tend to increase or retard its rotative motion, and for this there must be a compensation, as its rotative motion does not, on the average, vary, and this compensation is in the starting of the train. When the engine is started it is a question whether it moves forward or the rails beneath it backward, and while the speed continues accelerating this backward force acts on the rails and on the earth ; as soon as a uniform speed is maintained, the forward pressure on the air is equal to the backward force on the rails, and equilibrium occurs so long as the speed remains unaltered. This applies directly to the following catch problem. A bullock or other animal is fastened by a long chain to the mast of a vessel ; he is supposed to be standing aft, when he suddenly rushes forward to the end of his tether, where he is suddenly pulled up. Will the shock of stopping him augment the speed of the vessel? Certainly it will ; but during his rush the backward pressure of his feet, corresponding to the forward momentum he was acquiring, was retarding the vessel—the effects of his efforts upon himself and the vessel being proportional to their weights and resistances to motion. This question may be put in many different shapes, but will always work out the same if all the circumstances of the case are fairly considered.

Another problem is :—Suppose two trains travelling in the same direction at the rate of one mile a minute and being a mile apart, and at the rear of the first train there is a cannon, loaded, and capable of discharging its shot at a muzzle velocity of one mile a minute, what will be the result of firing the cannon? The ball within the cannon is moving in the direction of the train, at the rate of a mile a minute, so when the powder is fired which would give it that velocity in the opposite direction, it simply arrests the motion of the ball the cannon leaves to fall on the road ; the reaction of the powder on the breech of the cannon imparts to the train the momentum previously invested in the ball, therefore the train has the same accumulated work, while its weight is reduced by that of the cannon ball, and its velocity therefore proportionately increased.

From the foregoing remarks it will be seen that the points raised admit of very clear and simple treatment, and call for no particular mathematical ability for their solution, and yet it is astonishing how many people are puzzled by them, though this may in some degree be explained on the ground of expecting something involved where all is clear ; but at all events they afford an opportunity of showing how perfectly the forces of nature balance, and thereby present an absolute check against all calculations connected with mechanical work.

It is further seen that the principle of action and reaction being equal in intensity and opposite in direction is not in its application confined to forces acting upon a body at rest, but also finds its place in regulating the phenomena of motion. Co-important with all, at the completion of any cycle of events matters are in exactly the same condition as they were at its commencement, thus evidencing the constancy of the quantity of energy in existence.

It might be interesting to some to pursue this matter further, but my idea in making the above remarks has been to emphasise the expression of the primary laws of static and dynamic force without becoming abstruse, and to this end I think enough has been said. At all events, sufficient has been advanced to render the subject intelligible and, I hope, interesting to those who might fail altogether to grasp it if it were brought before them in strict mathematical parlance, and it is to such as these that I venture to recommend the attentive perusal of the present paper.

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MY CRICKET BALL: HOW I MADE IT.

BY FRANK HINDS.

I DARESAY many readers of WORK will like to know how I made a cricket ball that stood the knocking about of a season with some old corks and other materials. The corks were cut square and glued together with ordinary glue, and when quite dry I trimmed the cork mass neatly round, and then bound it with twine until large enough, and then glued it well all over and hung it up to dry. Having procured some suitable leather, not thick but strong, I cut four pieces the shape of Fig. 1, in length half and in width a quarter the circumference of the ball, allowing a quarter of an inch all round for the seam. I then soaked the leather in water a short time to make it soft, and then fixed two of the pieces between two pieces of wood cut to the same shape as the leather, for they act as a guide in sewing. I put them into a vice, as shown in the illustration, Fig. 2, the inside of the leather outside, and with two harness-makers' needles — one on each end of a waxed thread—I sewed them together, making the holes with a small stabbing awl. When the two halves were done the seams were laid open and hammered down flat. I then sewed the two halves together on the ball. There are two ways of doing this—one is to sew them together with a straight awl and cut the ends off close, open and hammer down, or to sew it with a bent awl, have the seam bent over, and take in one stitch four pieces of leather instead of two, which makes a much better job and stronger, but more difficult to sew perhaps. Fig. 3 will help to show how to do it. The stitches must be pulled up close; the leather will shrink in drying and make all tight. The seam can be trimmed neatly with a sharp knife and flattened down with a hammer. Harness-makers' needles are needles without sharp points. The slightly bent ones are the best for sewing the leather on the ball. A small bent awl can be had at any leather cutter's, as well as hemp and wax (shoemakers' wax) to make the thread.

The hole in the leather is bored with the awl, and as it is drawn out one needle is passed through from the opposite side; and while one needle is in the hole the other must be passed through one needle, acting as a guide to the other.

It may appear difficult to hold the ball while you are sewing it. Fig. 4 may help you to understand how it is done. A piece of wood, say a foot long, is screwed on the bench with a long screw. Having cut a hole in the centre not quite so large as the diameter of the ball, and with your foot in the strap or string, the ball can be held fast while it is being sewed, and easily turned round.

To some no doubt this may seem a long explanation of a simple job. But I hope it may be of use to some fellow cricketer whose boys have split their cricket ball, and that it will put him in the way to mend it before the next fine day. Many a time they have run to me with a broken ball, and in a few minutes I have made it sound, whereas if they had had to take it to the nearest shop it would have spoilt their afternoon game; or if it had been knocked about more entirely broken to pieces, for the old saying comes in here, "A stitch in time saves nine."

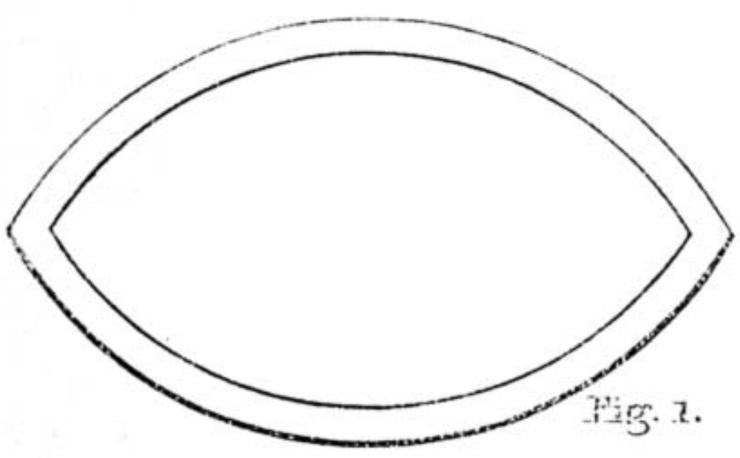

Fig. 1.

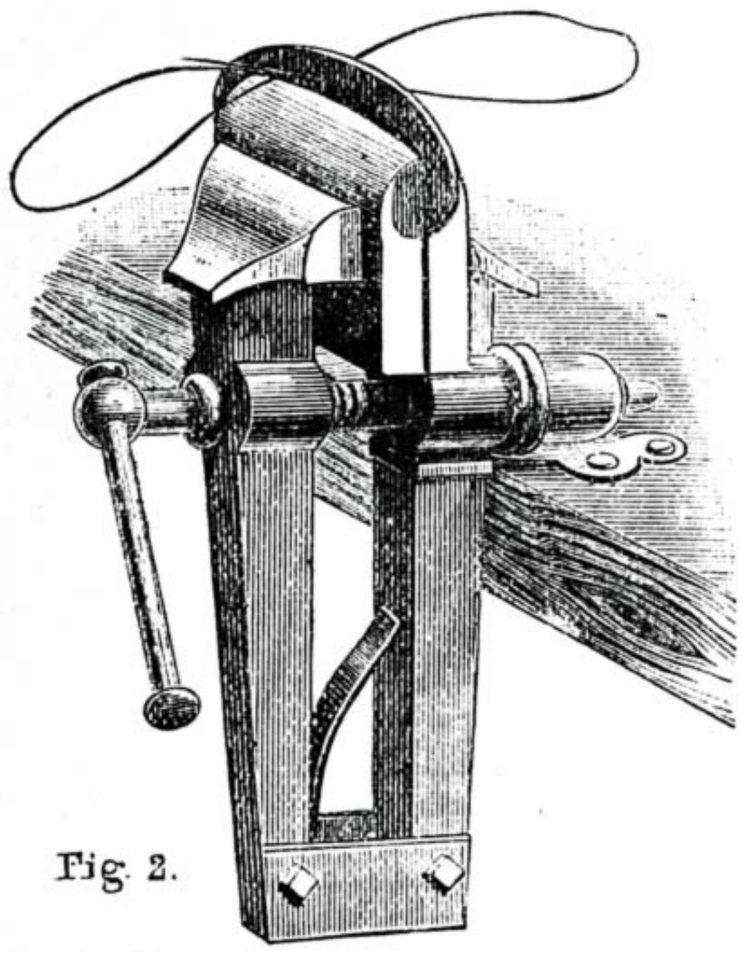

Fig. 2.

Fig. 3A.

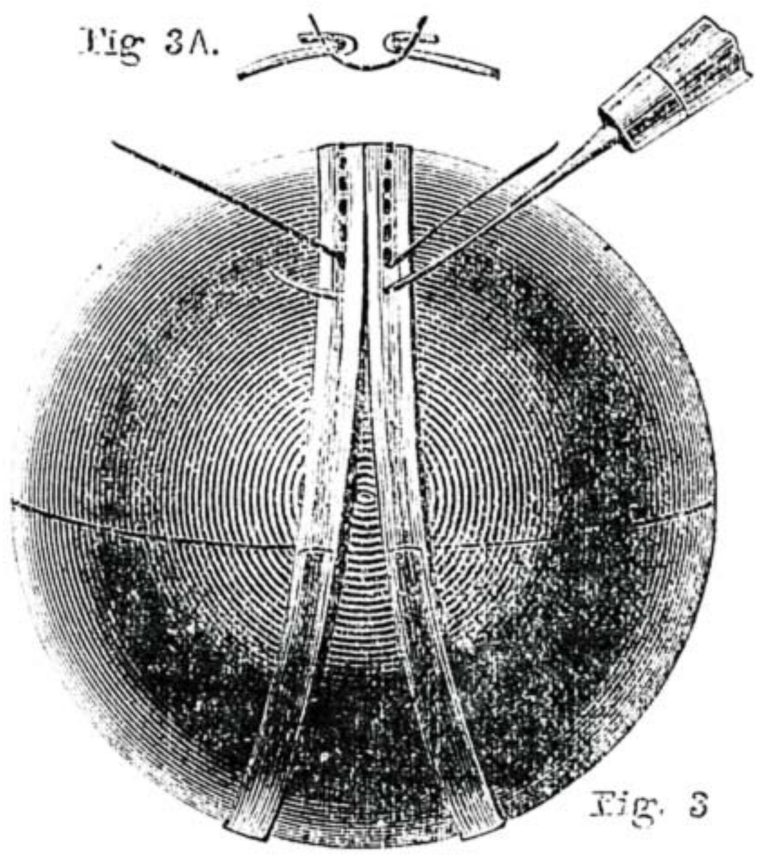

Fig. 3.

Fig. 4.

Fig. 1.—Shape of Gore of Leather. Fig. 2.—Mode of holding Gores when Sewing together. Fig. 3.—Mode of Sewing Halves of Leather on Ball. Fig. 3 A.—Section of Edges of Leather. Fig. 4.—Appliance for holding Ball during Sewing.

THE ART OF GRAINING.

BY A LONDON DECORATOR.

GRAINING, OVERGRAINING, AND SHADING OAK.

THE student of graining must be prepared to expend a considerable amount of his time and patience ere he acquires proficiency in wiping out the "lights" or figure of oak—at which stage of the imitation the subject was left in the last paper. Presuming, however, that each evening for a month at least has been perseveringly devoted to this end, and that the worker has so far availed himself of copy, graining panel, and my previous instructions as to be able to imitate the natural characteristics of the wood in some half a dozen different treatments, he may now with advantage turn his progress to practical advantage by graining an ordinary four-panel door. The door, having been carefully prepared and "grounded" in accordance with my preceding papers, it is finally lightly glass-papered and well dusted down.

In *graining a door oak*, it is advisable to use both a full-size paint-brush and a tool (see "House-painters' Brushes," page 820, Vol. I.) for spreading the oil graining colour. If both are nicely "worn in" to a level edge, and providing the graining colour has been properly mixed according to my directions, no difficulty will be experienced in spreading the same evenly but barely upon the door.

The "rubbing in" of graining colour is worked on similar lines as are followed in plain-painting a door. At the risk of repeating oneself, it is, perhaps, advisable to briefly indicate the method. Suppose, my reader, you stand aside, figuratively, and watch an experienced hand for a few minutes. My first action is to get a small wooden wedge, and so fix the door that I can comfortably work on it. Now, the brushes being well worked into the colour, and being previously clean and free from any white lead or coloured paint, I place the pot conveniently to my right, and with the large brush in my left hand in reserve, I start with the tool. We all know that every door must have two edges as well as two sides; one of these edges is always treated with the inside of the door. You see this door opens towards us, into the room, therefore the front edge belongs to the inside treatment. The edge is now first rubbed in, after which I coat the panel mouldings. It is apparent that a little graining colour goes a long way, as there is sufficient left in the tool, from "working it in" at the start, to cover all the mouldings. Besides the two brushes, you will notice that it is a further advantage to have a smaller one, called a *fitch* (see also "Painters' Brushes"), for this enables me to go into the "quirk" of the moulding and to pick out any superfluous colour at the mitres, without severely rubbing and forcing the hair of the tool into such recesses. Now I change hands with the brushes, and, using the large one, the four panels are coated from the top downwards. Although I find sufficient colour in this brush for one large panel, I must take a "dip" to finish the door. Here, you see, there is a difference from plain-painting a door. When using a body colour, we can take a good generous brushful, leaving the superfluous portion against the side of the paint-pot; but with graining colour, such a quantity would be sufficient for two doors, and would make it impossible for me to give this one the bare but even coating that

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is desired. This is a more important matter than it may at first sight appear.

The panels being covered and laid off the way of the wood, from top to bottom, I start with the stile between the top panels, next the top rail, bringing the outer stiles down some distance also. Here, again, I coat the stile between the lower panels, then the wide middle rail, or lock rail; then the bottom rail of the door, and, finally, finish with the long outer stiles, which run the whole length of it. You have seen how, having first spread the colour evenly on each portion so that it is all the same depth, I lay it off lengthways, or perpendicularly, just as the wood is used which forms each part of the door; and now, having given the mouldings a final "lay off" with the tool, you can bring out your combs and graining tools and start with the four panels.

Fig. 24.—How the Sap is wiped out.

The varieties of plain combing in oak graining is a matter it will now profit the student to consider here.

Assuming that the door panels have been creditably combed and veined after the manner indicated in the preceding paper, the learner will naturally inquire, "How should the remainder of the door be treated?" In offering some assistance upon this point—which is one that scarcely any two grainers are entirely agreed upon—I must mention that there appears to be two working principles which stand before any questions of individual choice or experience. The first of these—that the constructive lines and framing of the woodwork must be *rigidly* adhered to—is a matter I have explained in "rubbing in" and "laying off" the colour. Second to this, we have to consider it the duty of the grainer to treat the door in such a manner that its *design* and proportions shall be clearly displayed and "set off" to the most advantage.

That the recessed and moulding-framed *panels* are the most suitable portions for the best figured work displayed upon a door no one will question. Such being the case, the woodwork surrounding them should certainly not only frame, but act as a foil thereto. I therefore, personally, must recommend a good variety of cleanly-executed "plain combing" for the bulk of the remaining woodwork. The usual exceptions to this simple treatment are the middle rail, the bottom rail, and, occasionally, the narrow rail across the top. A large proportion of grainers invariably make a practice of imitating a piece of the "heart of oak," or sap portion of the wood, across the entire width of the lock rail. The success of this treatment will very much depend upon the manner of its execution. Fully three-fourths of the "sap" (so-called) that is worked in this position consists of coarse ungraceful markings, unnaturally wiped, and very crudely breaking into the coarse surrounding grain. When, however, a piece of "sap" is neatly and properly executed, I see no reason to condemn its introduction, although it should always be executed with subservient effect to the panels. The alternative treatment of the lock rail is to comb it into grain of a graduated nature, and then to work a little quiet figure thereon—this, of course, being put in across the grain, just as in graining the panels. The latter method is one often applied also to the bottom rail, and is equally acceptable there; whilst the very coarse grain and sap which is occasionally used on the top narrow rail is less happy in effect than on the lock rail.

Fig. 22.—How the Figure is wiped.

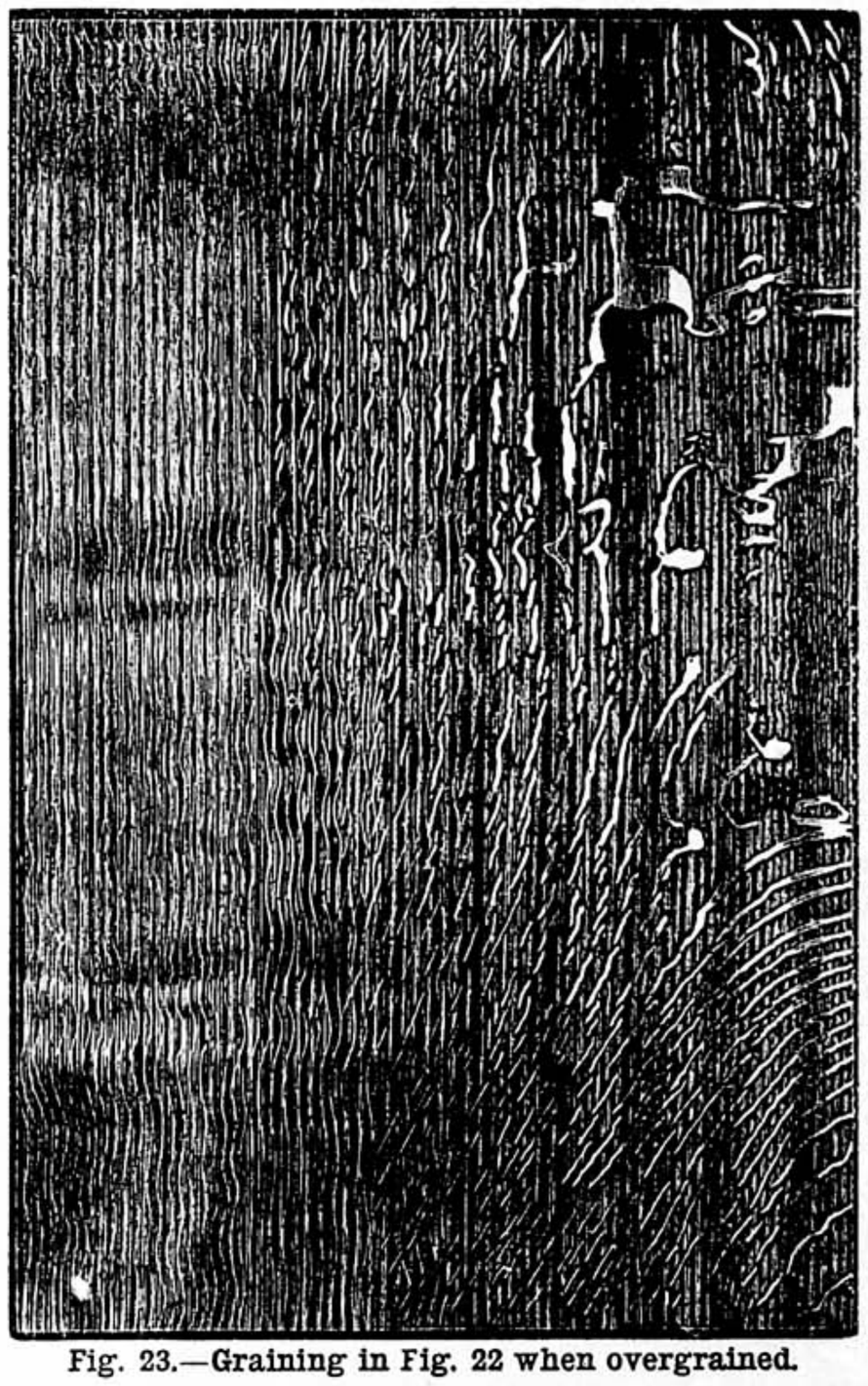

Fig. 23.—Graining in Fig. 22 when overgrained.

The characteristic markings and growth of the sap, or heart, of oak will well repay the student's careful study, and also his practice in "wiping." I am well aware that many good grainers will never use it. Some will say that as the sap is the least acceptable portion of the tree, the carpenter would seldom put it into a real oak door. This may be right in theory, but I venture to think the coarse-grained and sap is to be seen in a real door more often than not. Observation on the student's part will well repay him in

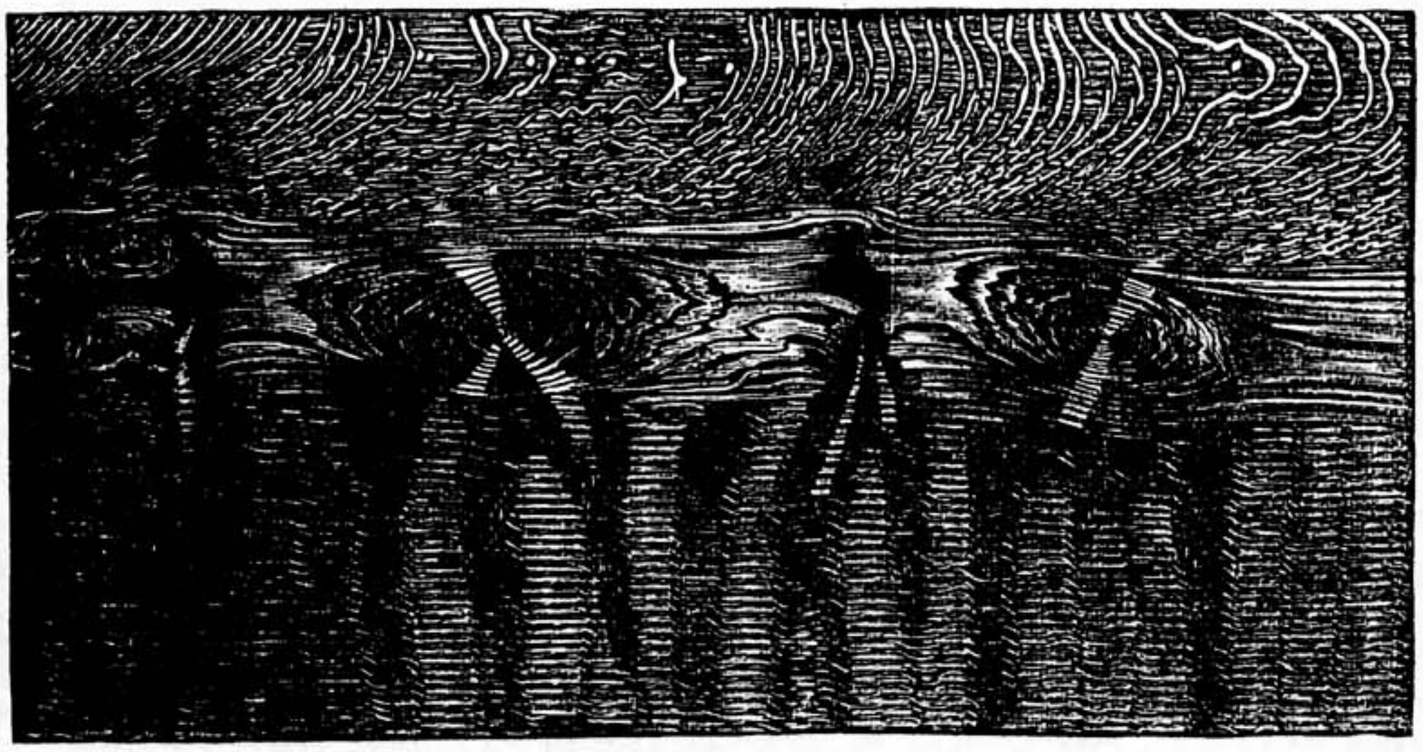

Fig. 25.—Appearance of Sap when shaded or overgrained.

such matters. Again, there are some professional grainers, to one's personal knowledge, who, notwithstanding they are able to wipe the lights most naturally, can only make "a poor fist" with the "heart;" and therefore, knowing this, they naturally decry its use. Other experienced workers also contend that only on the thickness, or "returns," of a piece of work should sap be worked; but this also may not be so acceptable in general practice as it appears on paper, for the grainer who sets himself the task of showing the growth of the wood upon face and thickness both requires exceptional skill and knowledge. Independent of this, I do not think the mouldings of a panel are improved by coarse markings worked *across* their bulk, which would neither assist the contours of the moulding nor give a better effect to the panels.

With this brief consideration of what is most in vogue, and the reason and effect thereof upon the remaining portions of an ordinary door, we will now turn to the completion of our imaginary sample. The graining colour I laid off carefully, as you must both remember and practise, cutting up each joint with the brush in a sharp line. Before using the combs, I here take a handy little straightedge, and laying the thin, bevelled edge against the joints of horizontal rails with the perpendicular stile, I wipe off, with a clean piece of rag, a little of the graining colour from one side. This will further define the joints as they exist in the real wood.

As one specimen of combing effects, I now take a coarse gutta-percha comb and draw down the stile between the upper panels, giving it first a straight and then a slightly angular direction. I now go over this with a medium steel comb, and, using it a little out of the upright, obtain a fair effect of coarse combing. The stile between the bottom panels is now similarly worked, but hardly so coarse in grain. The top cross rail is next combed with a coarse steel comb, and then a fine one, which gives a somewhat light effect. Here you see my combs have gone over the limit and on to the outer stile. This must be put right, or, in combing the latter, we shall get a "muslin" marking instead of a grain. To this end I place the straightedge up the joint, and with the paint tool, used comparatively dry, I remove the objectionable comb marks by carefully brushing them out. The lock rail next invites my attention. Using a coarse gutta-percha comb, I commence on the upper half to wipe out the colour, giving the comb a curving movement, and thus varying the width of grain, and suggesting the formation of the "sap," which is worked into it. I now, with rag and thumb-piece, wipe out the heart, working from one knot, or centre, into another centre, according to the growth in nature, which the learner must explore. To finish this, I take a fine comb, and diagonally cut up the coarse grain surrounding the sap, and also use it carefully upon the latter, taking care that there is no harshness of figure or of general effect, and graduating the coarse combing in a natural manner. The bottom rail I now comb in a plain and graduated effect, and content myself with putting in a few simple lights across the top portion. Making sure that my combs have not again intruded upon the outer stiles, I finish these latter by a level combing with the 4 in. steel coarse comb, and then draw the fine comb in a wavy motion down the entire length. The mouldings finally are combed with a little variety, care being taken, you see, that the mitres are cleanly treated. The door now can stand and dry, when it will be ready for overgraining or shading.

Before leaving this practical stage of the work, I may with advantage indicate some other plain-combing arrangements. If, as is advisable with a learner, he does not try his hand at "heart" upon the lock rail, using instead the graduated combing and simple veining, the whole of the perpendicular stiles might with advantage be treated with the same plain clean combing with two steel combs. The rails should then be worked with a good variety of combing and veining, and the complete effect will be very much as would appear in real oak, the action of light upon the different ways of the "grain" giving the variety of depth at which we are aiming. In combing a light piece of grain, a "woody" effect can readily be obtained by placing over a coarse steel comb a piece of "paperhangers'"—that is, a loose, very open—canvas. A yard of this stuff is a good and useful help to a grainer, but it requires a thorough washing to free it from "fluff" ere it can be used for the purpose mentioned. A piece of rag must always be at hand, and each comb should be wiped after every stroke. Plain-combing in itself makes a serviceable and pleasing finish to the woodwork of basements, etc., and can be recommended before much of the "rubbishy" figuring one sees repeatedly in small houses. Practice alone will make the student a good, clean, and quick worker with the combs, in which matter my written instructions cannot, I believe, further aid him.

Overgraining and shading oak is the final process applied to all imitations of oak worth calling such, the object of which is to give more variety of natural depth to the work, and to enrich the whole effect. It is worth noting here that, beyond the national associations of the wood, and its beauty and serviceability, the oak has another prominent claim for obtaining the first place in any practical considerations of the imitative art, and this from the fact that the two processes of "oil" and "distemper" are both used in graining it. The preceding part of my paper has been occupied with the manipulation of oil colour. In now following the overgraining process, the student, whilst completing his study of oak, will further acquire knowledge and facility of execution such as will materially aid him later on in graining other hard woods, which are usually worked in distemper, or water, pigments.

"Overgraining," as practically interpreted by most grainers, means the application of very weak stains of a pigment, ground in water, upon certain parts of the grain and veining, and in such a manner as the real effects aimed at are displayed in the natural wood. We have previously seen how the grain and figure are obtained by the use of one transparent oil colour manipulated upon a solid, opaque ground. It is at once apparent therefrom that no *variety* of depth of colour is possible with these two factors only, hence the "overgraining," or "over-*shading*, of portions of the oil graining. If we further examine the grain of the real wood, we are easily made aware of what our oil-grained combing now appears lacking in—a variation of shade and a "softening" of some portions of the grain. Beyond colour *depth*, it is the province of overgraining to either warm or cool the oil graining, to enrich or to make more sombre, according to our requirements of finished colour, different constructive divisions of the door or other woodwork. In order to more simply and practically illustrate these remarks, I will take the required tools for overgraining oak in water—viz., a medium oak overgrainer (Fig. 15, "Grainers' Tools," page 40, Vol. II.), the badger-hair softener (Fig. 16), a small piece of sponge, a piece of wash-leather, and a partly-worn paint tool, and with these finish graining our door. The paint-tool, which will answer the purpose of a mottler (Fig. 5) for our present purpose, must be perfectly free from oil paint or grease of any kind.

The water pigments used for overgraining oak are principally Vandyke brown, ivory black, blue black, and occasionally the siennas and Prussian or indigo blue. As I purpose devoting the succeeding paper to a brief *résumé* of the varieties of oak, and the grounds, graining colours, and pigments used for such, I confine myself here to a description of the *modus operandi*, and of those pigments only which I prefer to use in finishing a door already combed and figured in imitation of very light or new oak. To this end, I take a little of each Vandyke brown and blue black (both purchased ready ground in water), and place them upon the side of a palette (an old plate will answer), and have also at hand the tools just mentioned and a little diluted beer in a vessel. Had I a large amount of work before me to overgrain in water, it would be preferable to stain a quantity of the liquid to the desired depth and colour in a vessel; but with only one door side this is not necessary.

Vandyke brown is the pigment most extensively used for overgraining oak, its richness and transparency making it suitable for all varieties. For the new-oak colour applied to our door this pigment alone would give our finished work too warm a general tone. I therefore stain a little of the beer with a little blue black and Vandyke upon the plate, then dip the long oak overgrainer (Fig. 15) into the beer, which makes the hair cling together; and here I work the stained liquid into it, which is ready prepared on the plate. If the overgrainer had not naturally formed itself into the two or three divisions of hair, I could easily have given it that effect with the fingers. With the brush well charged, you see, I now place the hair thus divided upon a panel, and draw it down in line with the grain. This shading I prefer to apply rather sparingly down the figured half of the panel, and, as I replenish the brush after each continuous stroke from top to bottom of panel, notice that the hairs must not separate into divisions of too fine a nature, which would give a "liney" effect to the panels. Before the markings have had time to dry, I now take the badger, and, with a gentle "flicking" motion across the panel, ease off the hard edge of each line. Having similarly treated the two upper panels, the shading being only just noticeable, I take the tool, and, with an equally thin wash, I put in a few broader horizontal shades upon the lower panels, placing them where the grain has been given any decided curl or inclination. This being softened off at once, the lock rail, with its sap, is next treated. The sponge is now dipped into the stained wash, and then, well charged, is "dabbed" against the knots, or centre of the heart. Before the colour can run down, I bring the badger into play, and by it, with a facility acquired with practice, the colour is manipulated into a patch, with its darkest parts over the knot, and its extreme limits so softened as to be nearly imperceptible. Now I take the damp

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leather, and, by folding it and using my thumb, wipe a couple of sections cleanly out of the knot shade. The badger gives a final softening, and having put in, with the tool, an occasional dark shade where the sap takes any decidedly "knotty" turns, the lock rail is finished. The two short stiles between the pairs of panels I now shade with a darker wash of a warmer tone, wiping out a light where the grain turns. Across the top rail the tool is now crossed at broadly regular intervals in a very light wash, and then well softened across. The outer long stiles are finished with solid shading, whilst the wide bottom rail I leave with a dark shading to the lower half, and lighter effect on the top edge, so that the joint of the same with the small stile between the lower panels is emphasised and clearly preserved to the eye.

The plan above described for overgraining, in the ordinary sense, a four-panel door is one that preserves the unity of the structure to the eye. If there is too much cross-shading to the panels or rails, the effect is not conducive to repose, whilst the general darkening of the stiles, especially the outer ones, frames up a door very pleasingly. The strength of the washes used must always be so faint that, when varnished, the two oil and water processes become mellowed into one effect. If the overgraining is sufficiently obtrusive—either by difference of colour or depth of shade—to allow it to be clearly picked out by the eye from the combing beneath, it is overdone. There are many other simple and woody treatments for overgraining oak, and these the learner will be best able to acquire by the study of masses of real wood, and especially the finished graining of experienced workers.

Shading, or glazing, oak is a process by which either old or new graining can be altered in tone or colour by using *oil colour*. As this requires no megilphing, a drying mixture simply needs to be stained according to desired colour. Grainers occasionally glaze over portions of their new work, such as the stiles as above treated, with the same graining colour, and may also coat the panel mouldings with the same. In matching old graining, the oil glazing process may be useful in helping to get the mellowness which, independent of the graining, the ageing of varnish gives to work. Whether used partially, as just indicated, or as a means of converting light-grained oak into medium, or medium into dark oak, this is a practice that any intelligent worker who has mastered the foregoing will easily be able to accomplish. Occasionally the glazing principle is reversed, if I may so term it, in this manner: The panel is rubbed in, figured with lights and half-lights, but not combed; when this is dry, the oil colour is again spread thereon, and the imitation of *grain* obtained with combs of gutta-percha, cork, or a similar soft material. The grain which crosses the lights is then wiped cleanly away, and the work is finally overgrained and varnished. It is very obvious that this method would be too tedious for all ordinary purposes, but the zealous student will not fail to practically study a process which is capable of being developed into imitations far more realistic and natural in effect than the usual method will allow.

Whether the worker uses gutta-percha, steel, or leather combs; whether he wipes his figure with nail or thumb-piece, or shades in oil or watercolour, are really but secondary considerations. Providing the grainer understands and feels what effects he is working to obtain—a knowledge to be derived only from painstaking study of natural samples, which cannot be reiterated too persistently herein—and providing, beyond this, that his study of the nature and qualities of the materials and tools he uses is of an equally thorough description, then unceasing application can and will find its own methods, and success alone will justify them.

CANOE BUILDING IN WOOD.

BY AN OLD OARSMAN.

PAINTING—LAYING ON DECK—FINISHING OFF—INDIARUBBER COVER—WOODEN COVER—BACK REST—PAINTER—SEATS—PADDLES—INTERNAL FITTINGS—RUDDER—MAST AND SAIL—BOTTOM BOARDS—STRETCHER—CLEATS—WHEELS.

WHEN all is ready for the deck to go on, the whole of the inside fore and aft of the well should be painted with at least two coats of paint, also that part under the bottom boards. This prevents the damp causing rot. When this is done, the deck should be laid on. A very convenient way of doing this is to have it in two parts—which allows for expansion during hot weather—nailed or screwed down the centre fore and aft beam (see Fig. 19). When all is ready to put on the deck, all parts which it covers should be painted, so that no damp can settle and cause decay. The deck, of cedar, is usually from ¼ in. to ½ in. thick, and carefully selected, so as to be free from knot or shake. Having fastened it along the centre beam, it is fastened with screws or nails into the stringer next the gunwale, care being taken to press it gradually into the proper curve over the deck beams as each screw is driven home. When all is in place, the edge of the deck is cut away close to gunwale and shaved down with the smoothing plane, the final finish being given with glass-paper. If this is well done, it should look like a piece of cabinet work, and, if properly fitted, will be water-tight. The coaming which surrounds the well is made of ash, oak, cedar, mahogany, or other wood most convenient, but as good a material as any is an ash hoop, which can be procured at the cooper's, and is then planed down to a quarter or three-eighths of an inch thick, and from one and a half to two or more inches deep; or any other wood can be treated in the same way, this having been steamed or soaked in hot water, so as to be soft and tough enough to turn at the corners, beginning in the centre of the fore end of well by screwing it to the deck beam. A strut of wood is used to force the hoop into the corner of the well (the corners are curved at a small radius), and so on in each corner. The join, or two ends, should meet in the centre of the side of well, and there be joined with a scarf. The hoop being driven into shape as nearly as may be, screws are inserted one after another from the first in centre of fore part of well, at about an inch and a half or two inches apart, until all is fixed in place and the scarf of the ends is made. The coaming is then finished off with plane, spokeshave, rasp, and glass-cloth. If properly done, this makes a very strong piece of work, quite capable of bearing the weight of the canoe when lifted by the sides of the well. These sides are usually covered with a thicker deck than the other parts. This is to take the strain off the cleats and other fittings screwed to them. These side decks are eased or bevelled down at the ends to meet the other parts of the thinner decks.

It is a good plan to attach a bead of American elm or ash along the edge of the deck outside, so as to take the rub which must inevitably take place from daily work in going alongside boats, locks, quays, or anything else. It is made like the section of a bow, flat on one side and half-round on the other.

The shell of the canoe being finished, it should be well rubbed down all over with glass-cloth on a piece of cork, the final touch being given with some fine glass-cloth. All roughness, uneven marks, etc., should be quite removed. This being done, you proceed to finish off the keel, stem, and stern posts to the proper size to take the metal band (whether copper or iron), which runs from the top of the stem along the keel and up to the top of the stern post. This is used to save the wear and tear of those parts which it covers, and is usually a band of metal of from one quarter to five-sixteenths of an inch wide, by two to three-sixteenths thick. It is attached by screws or nails at various distances along its length—say, at from five to six or eight inches. It is a good plan to fix rubbing pieces or bilge keels of hard wood on each side on the edge of the second or third plank from the bottom. This greatly preserves the planks. Three feet will be long enough. They should be half-round on the outside, and half an inch wide, fixed by screws or copper nails parallel to the keel.

When the shell of the canoe is completed and finished off with glass-cloth until as smooth as a dining-table, it must be done all over with the best copal varnish. This must be allowed to dry and harden until it can be handled without sticking to the fingers, and then at least two more coats must be put on, each drying completely before being handled. She will then be fit for use.

The well should be covered when in use, and this can be done with an indiarubber cover, or a wooden one of light cedar.

In making the indiarubber cover, use two pieces of cedar about ½ in. thick, the same length as the well, and about 4 to 6 in. high, just where the knees come when one is seated in the canoe. This strip of wood is sloped away from where the knees are, both forward and aft (see Fig. 20), to about 2 in. in width: these pieces of wood are placed on either side the coaming of the well parallel to one another, and are kept in place by two bits of wood screwed to the deck with two screws; these pieces of wood are 2 in. long, 1 in. high, and ½ in. wide (see Fig. 21). When in place, a sheet of indiarubber is laid over all and nailed through strips of leather with copper tacks to the edges of the two parallel pieces of wood. When all is completed, cut off the indiarubber close to the wood, leaving a flap to go over the fore end of the coaming, where it can be fixed when in use by a piece of cord led from a cleat on the port side, round the coaming to a cleat on the starboard side, this being fixed after the paddler has taken his place in the canoe. A cord should be run in at the edge of the flap of indiarubber and firmly stitched there; the after end, or that next the paddler, can be cut any size that may suit the fancy, a good plan being to have enough to reach up to the chest, and if very wet or rough it can be fixed to a button on the coat; such an apron as this will keep out any water or rain, and is very safe, as if an upset occurs it is loose and free from the canoe in an instant.

The wooden cover is made by having the side pieces a little heavier, and at least 6 in. wide all along the length, and a light piece of ash hoop should be curved over from side

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to side in two places so as to raise the deck in the centre (Fig. 22); the cedar or other light wood is pressed over these beams until it comes to the edges of the side pieces, where it is nailed and planed off to the line of the sides; the fore end can be finished with an ash hoop to fit round the coaming; the after end must be cut out, so that when in place it may fit round the paddler's stomach, and if found necessary a strip of indiarubber can be put on so as to be drawn round the waist and up to the chest, but if rough or wet, a cape can be worn which will come down and cover the hatch so as to keep out any wet; a small strip of wood should be nailed round the edge next the body to keep out any drip.

In the original Rob Roy canoe, a simple invention for a back rest has answered every purpose when on a journey; two pieces of oak, 18 in. long and $2\frac{1}{2}$ in. wide by $\frac{1}{2}$ in. thick, rounded from the centre to the edges like a rib bone of beef, are joined together by two crosspieces of the same size as in Figs. 23 and 24; the lower piece is grooved so as to rest on the coaming and freely work there when moved by the action of the paddler; it is kept in place by a piece of rope or indiarubber tubing passing through a small hole in the deck, and then tied together. Until this contrivance of Mr. Macgregor has been used, no one can imagine how comfortable it is: the two muscles on each side of the spine rest on the wood, the spine being between them, the result being that there is no fatigue from its use, and one can go paddling for days without feeling worn out. If any one doubts its efficacy, let him remove the back rest, and paddle a few miles without it, when he will find he will have a sore back from the rubbing against the coaming. When out of the canoe, this backboard lies close to the deck out of the way.

Another necessary part of the outfit is the painter; this had better be made from tanned rocket line such as is used on the coast for saving life from shipwreck, and can be bought from the ship-chandler's near the docks. To use it, there must be two holes bored through the tops of the stem and stern posts with a $\frac{3}{8}$th bit; through them the ends of ten fathoms of this light strong line must be passed, and a knot made in each end; this is quite secure enough, and can be used for tracking the canoe along the river-side, over the grass, or to drag her over any obstacle that may be met with in a day's journey, such as gates, walls, locks, fallen trees, or, in fact, anything you might encounter. When not in use, it is kept coiled up on the top of the hatch on deck; the best of this rocket line is that it never kinks like most other kinds of rope. By arranging the painter as described in the foregoing account, it is ready for instant use in case you have suddenly to jump ashore or fling it to any passing boat or steam launch for a tow.

Seats of various kinds are used to protect one from the hard bottom boards; some use a frame with cane plaited in like the seat of a chair, others an air cushion blown up, and a very good seat is a life belt rolled up with a spare pilot jacket folded upon it, but any one can improvise some kind of seat that may be suitable and useful.

The paddle (Figs. 25, 26, 27) is almost the most important article needed, as on it the progress of the Rob Roy almost wholly depends; it is usually made from a spruce plank, which has been selected so as to be entirely free from knots or shakes, and is from 7 to 9 ft. in length; the plank has the form of the paddle drawn on it, and it is then cut out with a saw, and finished with hatchet, draw-knife, plane, and glass-cloth.

Paddles of different kinds are used: if the canoe has a rudder, the paddle is short and one-bladed so as to be used one side, the rudder being held against it and a straight course thus ensured; paddles are

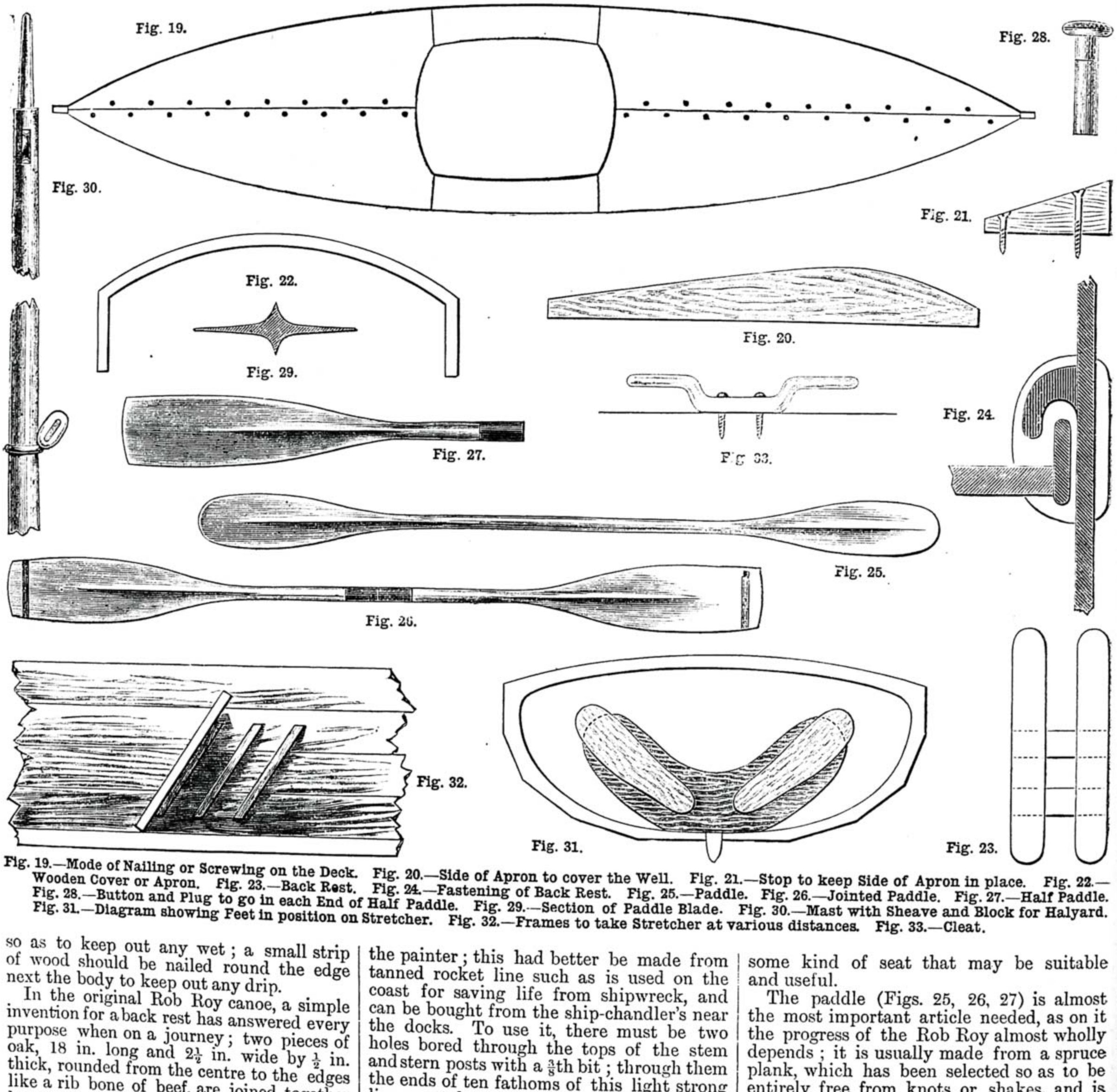

Fig. 19.—Mode of Nailing or Screwing on the Deck. Fig. 20.—Side of Apron to cover the Well. Fig. 21.—Stop to keep Side of Apron in place. Fig. 22.—Wooden Cover or Apron. Fig. 23.—Back Rest. Fig. 24.—Fastening of Back Rest. Fig. 25.—Paddle. Fig. 26.—Jointed Paddle. Fig. 27.—Half Paddle. Fig. 28.—Button and Plug to go in each End of Half Paddle. Fig. 29.—Section of Paddle Blade. Fig. 30.—Mast with Sheave and Block for Halyard. Fig. 31.—Diagram showing Feet in position on Stretcher. Fig. 32.—Frames to take Stretcher at various distances. Fig. 33.—Cleat.

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also made in two parts, being joined by a tube of brass in the centre of the handle, and if desired, they are divided and a plug (Fig. 28) is inserted, which from having a smooth, flat, button-shaped top, rests in the palm of the hand and prevents a blister; some paddles have the ends rounded, others square, but all have the ends of the thin blade protected by strips of thin copper which are folded firmly round them at right angles to the handle or loom, and are then tacked with copper tacks, preventing the blade from splitting, as it would undoubtedly do without such protection; if well made and the blades are kept thin, the paddles are very light, and their weight is not felt in a long day's paddle. In most cases, an indiarubber ring is put round the loom about a foot above the springing of the blade; this answers the useful purpose of keeping the water from running up the paddle and then up one's sleeves, and giving the paddler a good wetting. In making the paddle, the loom or handle should gradually fine away into the wash of the paddle in the shape of a web or rib, which should go half way down into the centre of the blade or wash, the wood being cut away on each side until the section appears as in Fig 29, and when finished the edges of the blades should be from $\frac{1}{8}$th to $\frac{3}{16}$ths of an inch thick; the final polish is given with fine sand-paper on a piece of cork.

The internal fittings of canoes are generally put in at the option of the owner. Very good receptacles for sponges, drinking horns, and any such articles, can be made with pieces of net fastened to the fore and aft piece which keeps the bottom boards in place, and just under the gunwale; the length is entirely guided by the fancy or requirement of the paddler; sometimes shelves are placed about 4 in. under the side decks and of the same width as the deck; these are very useful to put knives or any tools on to keep them out of the wet, or books and maps. In some cases, lockers are fitted in canoes, but are not necessary in the ordinary Rob Roy; about the best locker is to have a hatch so made as to fit closely over the coamings and have a brass bar over the top fitted with a padlock, so that the whole well can be covered over and locked up.

Rudders are a good deal used in sailing canoes, but are not at all necessary in the Rob Roy, as in the mere act of propulsion one can perfectly steer with the paddle, and rudders require a straight stern post to work efficiently, and so are not suitable for the curved stern of the Rob Roy.

A mast and sail is a great help on a journey, but it need not be large; the usual rig is a standing lug, the only spars required being a mast, yard, and boom; these should be made of good white or yellow pine. A good guide for the height of mast and length of spars is just what will stow forward under the deck; sometimes they are made with joints like a fishing-rod, but for the average Rob Roy this is not necessary. The usual way of fitting the mast with a sheave at the head, and a block near the deck, is shown at Fig. 30, and is by far the simplest. The boom can be attached to the mast in several ways: one is to use a strip of strong leather, another with a brass gooseneck, or an eye in the mast into which a curved hook at the end of the boom goes, will answer. Good strong cord is required for the halyard and main sheet; none is better than a six-strand cord which has stood the test of many years' use. All spars and masts, paddles, etc., must be kept well varnished, as then they do not discolour whilst the varnish is intact; should any signs of stain appear, the spar should be rubbed with glass-cloth until it appears as clean as when new, and then it should have three or four coats of varnish.

The planks at the bottom are protected by bottom boards, which are in separate pieces for each side of the keel. They are usually a little longer than the opening of the well, and are of $\frac{1}{2}$ in. plank about 7 or 8 in. wide, and on the underside of each end a slip of wood about $\frac{3}{4}$ in. wide is fixed to act as a stop when the boards are in place, by abutting on the timbers fore and aft, just inside them; if fitted properly, they cannot move; a piece of wood on either side parallel to the keel and screwed to the timbers keeps the bottom boards from moving away from the keel.

The stretcher is a piece of wood cut in the shape shown at Fig. 31, so that the feet may rest on it and take the thrust from the action of paddling, for without some sort of stretcher the body would be dragged forward from the strain of the paddle in the act of propulsion; it should be made of a piece of $\frac{3}{4}$ in. plank and rests on the keel, where it is supported with stops just as the stretchers in a rowing skiff (Fig. 32).

Cleats of various kinds are used for fixing the ropes or painter, and are usually of brass screwed to the deck; in a Rob Roy a cleat on each side of the well is generally used and found very convenient (Fig. 33).

Wheels to convey the canoe are easily made, as two wheels about 14 in. in diameter are fitted to an axle long enough to permit the canoe to come between them, and on the centre of the axle a strong trough about a foot long, made of ash screwed together, is fitted to take the keel, which when in a line is passed from the cleat on one side amidships, round the axle up over the deck, and round the other side of the axle and secured; when all is fixed, the canoe can be driven like a barrow.

MEANS, MODES, AND METHODS.

Pickle for Cleaning Brass.

Oil of vitriol (sulphuric acid), 2 parts; aquafortis (nitric acid), 2 parts, both by measure. Cleanse the brass article from all traces of grease and oil by boiling in a strong solution of common soda or potash. Then immerse in the pickle for a few moments, and avoid breathing the noxious fumes given forth by the mixed acids. Rinse quickly, when clean, in clear water, and dry at once in hot sand, sawdust, or bran. This process gives to brass a beautiful golden-yellow tint, which may be preserved if the articles are lacquered whilst still hot and fresh from drying.—G. E. B.

Electric Fitting for Clock.

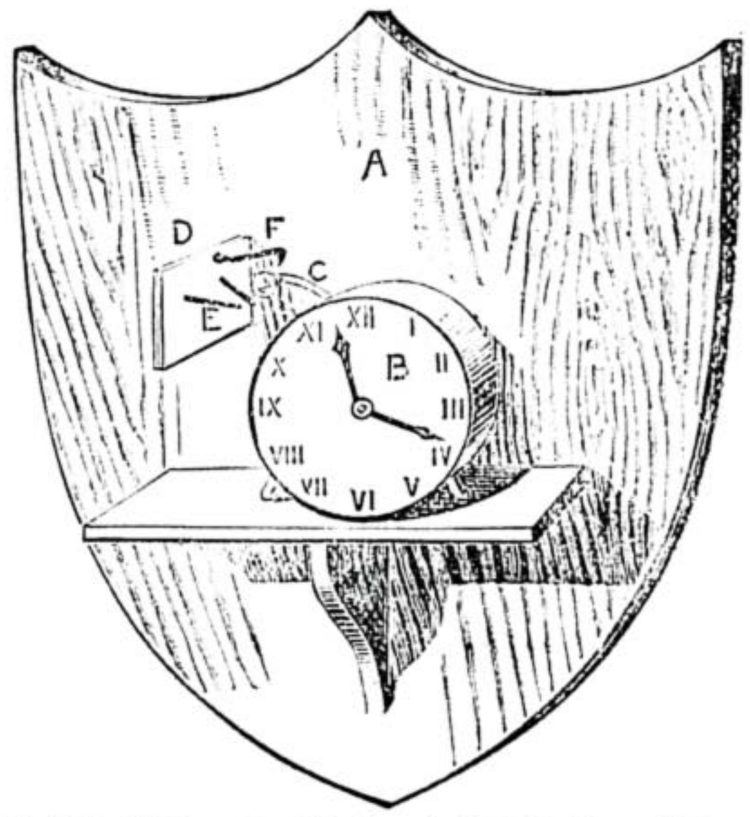
Another application of electricity to domestic use that may be of service to readers of Work is the following.

The fact that so many alarum fittings are required to be affixed to the face of the clock, and consequently cause a certain amount of disfigurement, prevents many people from having the fittings adapted to their clocks, especially those that happen to be valued for old association's sake, or for their own intrinsic worth.

The following plan is not at all a disfigurement, and has the merit of being effective, inexpensive, and practically noiseless. I was led to devise it owing to the annoyance caused by the bed-loving propensities of a maid-servant, and the necessity of some means of arousing her effectually without the discomfort of being myself roused at too early an hour. The means to this desirable end consisted of an American alarum clock, a battery and wire, and a continuous ringing or burglar bell.

The first and most important thing to be done was to fix the alarum clock (by means of wires attached to its feet) to a bracket, which was itself secured to a shield-shaped panel firmly screwed to the bedroom wall, care being taken to leave room for the hand, or at any rate for the fingers, to get to the back of the clock for the daily winding-up, or for setting or altering the alarum. My clock, one of the Ansonia make, has, as is usual with this type of timepiece, the alarum bell on the top of the clock, with a switch to shut off the alarum when not required to ring.

I removed the bell from the top, and with a small piece of black indiarubber tubing, like that used for feeding-bottles, covered the vibrating hammer that worked



Electric Fitting for Clock—A, Shield-shaped Panel with Bracket fixed securely to Wall; B, Clock; C, Vibrating Hammer of Alarum; D, Small Support at right angles to A, with Bell-Push or Wires, E, placed to admit of Contact being easily made; F, Spring Catch to hold C.

the alarum, with the twofold object of making it, firstly, as noiseless as possible in its action, and secondly, of insulating the clock from all chance contact with the electric wires.

On a small support fixed at right angles to the shield-shaped panel I arranged a bell-push, with a very flexible spring, connected with the two wires leading to the battery and bell, in such a way that as soon as the alarum hammer was started by the alarum going off at the required hour in the morning, it made the wire terminals touch each other, the circuit was complete, and the continuous ringing bell upstairs was set in motion, and went on ringing till the lazy handmaid felt in duty bound to get up—at any rate for the sake of stopping the bell.

Before the vibrating hammer makes the circuit complete, it passes under a light spring catch, which prevents it from finishing its usually prolonged and irritating series of vibrations. The hammer must of course be released from under the spring catch before the alarum can again be set to go off.

The panel may be of any shape that is desired, and may be dispensed with if there is any convenient woodwork to which

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the bracket and supports can be securely fixed.

If there is any difficulty in fixing the push, the ends of the wires may be so arranged that the rubber-covered hammer makes them touch one another, and so completes the circuit.—H. J. L. J. M.

A Disaster, its Moral, and its Cause.

At the beginning of my experience as a metal-worker, I met with an accident which, to say the least, was very painful and unpleasant. Being about to work on a repoussé plaque about 12 in. by 8 in., I found that I should require to use a larger pitch-block than I had by me. As I had always found empty meat tins very useful as paint pots, varnish pots, nail boxes, etc., I thought I would try one for melting my pitch and the other ingredients, using one of Fletcher's Argand Bunsen burners to give the requisite amount of heat. After breaking up the pitch, and mixing with the other ingredients, I began the melting process. The tin I used was a medium-sized one, and as I required a considerable amount of pitch melted, I made several meltings with complete success. When the fifth boiling was finished, I found there was rather more than I had put in each time, but not enough to make two meltings, so to save time I put all that was left into the tin. It melted quite as successfully as before (and began to boil), but as soon as I lifted the tin off the gas stove, out came the bottom of the tin, and the boiling pitch ran all over my right hand (with which I was holding a piece of wood against the bottom of the tin to steady it while pouring out the pitch), the whole of which, with the exception of the thumb and a part of the palm, was covered almost up to the wrist.

The pain for a moment was excruciating, but almost ceased as soon as the fluid pitch had cooled and set, only to begin again when the scalded parboiled skin was exposed to the air after the pitch was removed. I was able to help, left-handed of course, in doing this, and owing to my hand being more or less oily, as oil was one of the ingredients in the mixture, the pitch came off without much pain with the help of sweet oil applied on cotton-wool—and patience. When the hand was quite clean, it was dressed with zinc ointment and oiled lint, with cotton-wool *ad libitum* to keep out the air, and I went to bed, and, thanks to a stiff glass of something warm, to sleep. In the morning, each finger was enveloped in a blister rather larger than a pigeon's egg; the hand felt very stiff, and there was a painful sensation under the nails where the pitch had touched them. For some days there was much throbbing and pain, but in a little over a month the hand, which was dressed every day with zinc ointment, was quite well, there being not a sign of the scald to be seen.

The lesson I learned was to buy a plumber's melting kettle for my pitch, and I may add that I have never used a meat tin for the purpose since.

The explanation of the disaster that I can give is this: that the double weight of pitch in the last boiling forced out the bottom, the solder on which was melted out by the extra heat at which the mixture was allowed, inadvertently, to boil.

H. J. L. J. M.

A Cheap File Handle.

A very good temporary, or even permanent, handle for a large file or rasp may be made by cutting a short length of composition pipe as used by gas-fitters, tapping it gently all along till it loses its cylindrical shape and becomes elliptical (in other words, flattening it out slightly for the whole of its length), and then knocking it, without too much force, on to the tang of the file. If the file be first slightly warmed and dipped into powdered resin it will hold better.

Over this composition handle a piece of indiarubber tubing may be drawn, which will give one a better grip on the handle, and prevent the hands being blackened by the lead contained in the composition tubing.

A piece of indiarubber tubing slipped on to the point of a file or rasp will often enable one to get a good firm grasp of what is sometimes an awkward tool to hold.

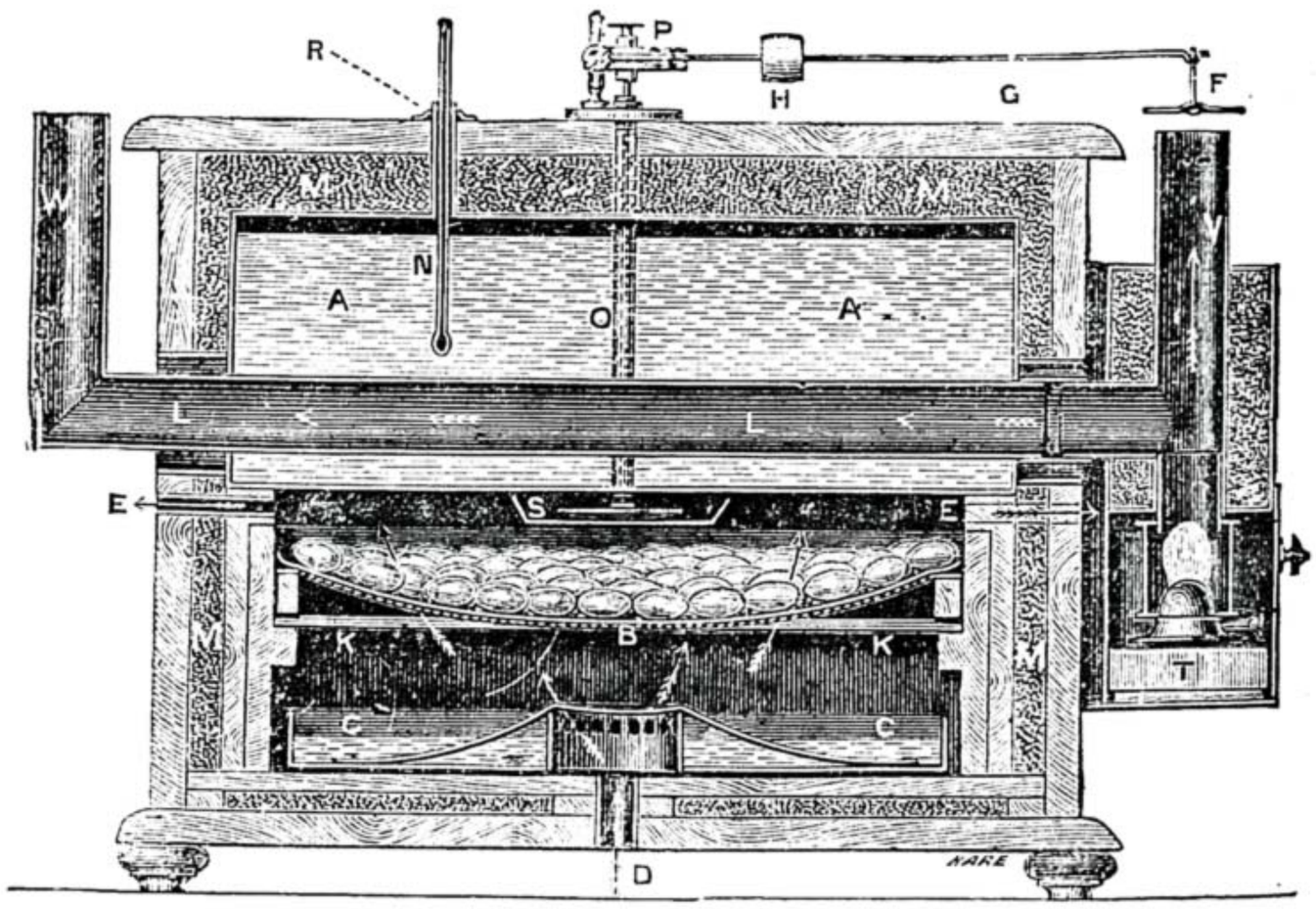
H. J. L. J. M.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

18.—Hearson's Champion Incubator.

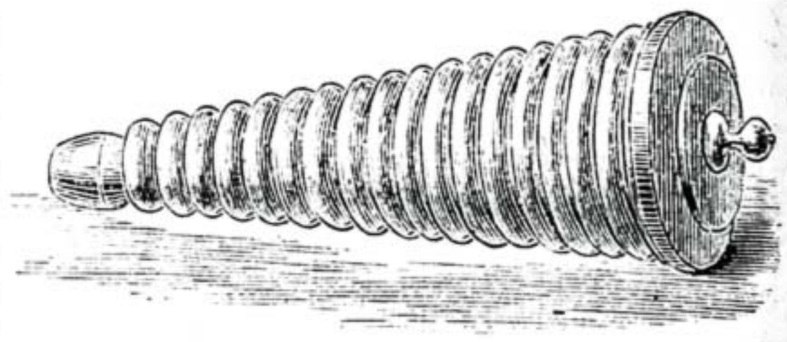
Many of the readers of Work have expressed a wish from time to time to know something of incubators, and I have much pleasure in saying that I have in my hands a practical paper on the subject which will appear when the days once more begin to shorten and work of this kind will be taken up more readily than in summer. But as some, even at this period of the year, may desire to have some little information about them, and have made inquiries about this particular incubator known as Hearson's "Champion Incubator," knowing only that it is an excellent one, and wishing to learn still further why it has proved so successful, I am permitted to reproduce the annexed illustration from Mr. Hearson's manual, "The Problem Solved," and to call attention to the book itself, which is sold at 1s., and may be obtained at that price of Messrs. Charles Hearson & Co., 235, Regent Street, London, W. To purchasers of incubators the book is supplied gratis. It contains a carefully compiled code of instructions regarding the use of the incubator, and also meets at once all the various questions that may be put by those who are curious about artificial hatching of chickens, and affords explanatory details on all points. Many, if not all, of those who have used it declare Hearson's "Champion Incubator" is the best yet in the market, and this, without doubt, is the secret of its success and popularity. The manufacturers are always willing to lend assistance to all who use their machines.



Longitudinal Section of Hearson's Champion Incubator, showing the Internal Arrangements—A, Tank of Water; B, Movable Egg Tray; C, Water Tray; D, Holes for Fresh Air; E, Ventilating Holes; F, Damper; G, Lever; H, Lead Weight; K, Slips of Wood; L, Lamp Chimney and Flue Pipe; M, Non-conducting Material; N, Tank Thermometer; O, Needle or Push Pin from Capsule S to Lever G; P, Screw with Milled Head; R, Filling Tube; S, Thermostatic Capsule; T, Petroleum Lamp; V, Chimney for Discharge of Surplus Heat; W, Chimney for Products of Combustion.

19.—Tait's Sulphur Puff.

This is an ingenious contrivance, invented, manufactured, and supplied by Mrs. Thomas Tait, 116, Rose Street, Edinburgh, Jewellery Case and Plate Chest Maker and Fancy Leather Worker, for puffing finely powdered sulphur on plants infested with insects or otherwise requiring dressing with sulphur. The nozzle is of turned wood, and is fitted within with a piece of very fine wire gauze, through which the sulphur is blown by the action of the bellows to which it is attached. This consists of a coil of wire covered with leather and bound with fine cord between the coils of the wire from the larger end to the nozzle, which unscrews to allow the sulphur to be put in. The knob in the middle of the larger end, which is of turned wood, also unscrews. They are made in all the different colours of French morocco, and are certainly most handy and cleanly for ladies' use. The form when at full length is shown in the accompanying illustration. It is sold by most seedsmen throughout the United Kingdom. I am not quite sure about the retail price, but this may be ascertained on application to Mrs. Tait.



Tait's Sulphur Puff for Plants.

The Editor.

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SHOP:

A Corner for Those who Want to Talk It.

NOTICE TO CORRESPONDENTS.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Machine for Current of Air.—OPIFEX writes:—"Judging from the numerous replies elicited by the original query (page 190, Vol. I.) on this subject, it must be one of wide interest. Many of the suggestions have been very good, but it seems to me that it is rather waste of time and money to attempt to manufacture such an article when it can be obtained at a very low price. I remember many years ago, when a child, being greatly fascinated by such a machine as that described by G. E. S., page 398, Vol. I., but, unless I am greatly mistaken, these blowers are altogether "out of print" in the present day, and in that case if one desires to possess one his only, or best, plan is to make it for himself. There is, however, a machine which I have found most useful, and which might serve the purpose of the original querist. It is a small fan running in a cast-iron cover, and driven by a 16 in. driving wheel with web band. This machine is made in Waterford, and may be obtained from Messrs. Booth Bros., 63, Lower Stephen Street, Dublin, for 12s. 6d., which to my mind, considering the efficiency of the article, is a marvellously low price."

Printers' Ink.—M. D. C. (*Wavertree, Liverpool*) writes:—"In reply to PARAFFIN (*Cardiff*) (see Vol. II., page 12), he is answering a thing he knows nothing about. He owns he is not a practical poster writer, then why does he criticise one? In answer to H. L. B., I said paraffin would not do to mix the ink with to write posters with, and I must tell you the same. Practice makes perfect, therefore practise before you preach to one who knows. As I said before, paraffin would not do to write posters with, as it leaves a greasy mark all round where the colour has been applied to the paper. PARAFFIN says the principal poster of his town goes for his empty tins to wash out what colours he leaves in. I don't think he can have many posters to write, or he would require more ink than the washing out of empty tins; and still he says his work is the talk of the town. Well, he does not say whether the work is good or bad, but there are some people who do not know the difference between good work and bad, and perhaps PARAFFIN is one. I asked H. L. B. what he would put in ink to keep it from working sticky. You say paraffin will keep it from working sticky, or leaving brush marks. How do you know if you have not tried it with a brush? If I were you, I should write about an article I understand, not what I don't understand. If paraffin will do for printing purposes, it is all right. I don't pretend to deny it, but you deny what you know nothing about. If H. L. B. knows more than I do, as you say he does, why does he not answer? I am open for his attack on this subject, or any one else. I don't wish to hurt any man's feelings, but I don't like to see people writing about what they know nothing of, and giving the readers of WORK bad instructions. As it is a good paper, let us have good information that we can trust to, not what I have heard. If you don't know it for a fact, don't mention it until you do know it for a fact, then we will get what we can trust to. I would not write an article on anything unless I could rely upon what I said to be a fact, as I would not like to be taken in, as a good many would if they tried to write posters with paraffin; therefore, I hope PARAFFIN (*Cardiff*) will try experiments before criticising a practical man in future and things he knows nothing about."—[The tone of your letter, and, indeed, of your previous letter, in Vol. I., page 715, is such that I am compelled to reply to you myself. Whatever may be said of me, or of anything that I do or say, or write or sanction, individually is a matter of trifling importance, and, indeed, when adverse, gives me infinitely more amusement than pain. I expect to be shot at, and am frequently exposed to very heavy fire, but having got used to it, as eels are said to get used to skinning, I enjoy it rather than otherwise, and, as all my readers must be well aware by this time, very seldom fire a shot in return. I cannot, however, allow my contributors and correspondents, PARAFFIN (*Cardiff*) and H. L. B., to be peppered without doing in their behalf what they will scarcely care to do for themselves, namely, reply to you in the same spirit in which you write. PARAFFIN (*Cardiff*) has written good-temperedly enough, and if you, as a practical poster writer, as I suppose you are, can give better teaching and throw more light upon the matter than what has been already given and thrown, why do you not do so? The pages of WORK and the columns of "Shop" are at your disposal, but all you seem to care to do is to find fault with what others say, and withhold the special knowledge that you claim to be competent to give, or to offer to give information privately, as witness what you say in Vol. I., page 715, under heading "Ink for Posters." Now the giving of, or offering to give, information privately is what I especially wish to discourage in WORK, which is essentially a Magazine for the propagation and dissemination of useful knowledge, and in which, as members of a great and grand co-operative society, all who are engaged in it, whether as contributors or correspondents, are earnestly striving to help and benefit those who read it by placing information at their command which they find it difficult to obtain, or might have to purchase, elsewhere. Therefore, if you have anything useful to say or recommend, why not say it at once instead of carping at those who, to the best of their ability, willingly give such information as may be in their power to bestow. As for H. L. B., he has been an esteemed and valuable contributor, for the last eight years at least, to magazines that have appeared under my editorship, and I have every confidence in his power and ability as a writer on all subjects that he cares to handle. By my express wish and desire, he will take no notice of the strictures you have been pleased to make on him, but his and my best reply will be found in the following extract from a letter from him to me in reference to "Poster Painting." He writes:—"I will now take the earliest opportunity of writing my promised articles on 'Poster Painting,' and after their appearance leave the readers of WORK to judge as to truth and utility. I need hardly say that having been for some years a scenic artist, and, as such, engaged in all the principal theatres in the kingdom, that I have painted some hundreds of posters of all descriptions, and that I have seen all the best poster writers of the day at work." Referring to the remarks made by PARAFFIN, and an idea that you seem to entertain that H. L. B. suggested an admixture of colouring matter and paraffin for ink for posters, he continues:—"I have no doubt the information given by PARAFFIN in Vol. II., page 12, is tolerably correct. Although I gave paraffin as a medium for printers' ink in my short answer to a query some months ago, I may say that benzine is the best 'thinnings' to use. I did not mention this, however, for reasons I will afterwards point out. I wish my readers to note that I have never even hinted at ordinary dry colours being mixed with paraffin, as M. D. C. would have one believe; no sane person would say such a thing, let alone recommend it." I can assure you that for your own sake, as well as for the sake of every reader who is interested in poster writing, I shall have H. L. B.'s article put into type as soon as it reaches me, and as he is assuredly not an amateur in this kind of work, I have no doubt that he will supply information that will prove useful and beneficial even to yourself, and give, if it be possible to do so, wrinkles for making chocolate, marone, salmon colour, and flesh colour that will not fade on exposure to the sun, or at all events preserve the original colour as long as the poster is required or expected to last.—ED.]

Mandrel for Lathes.—J. T. (*Walworth*) writes:—"I notice that a writer in your issue of this week recommends amateurs to go to the Britannia Co. if they want mandrels made for such lathes as he describes. It happens that some months ago I wanted a mandrel, a much simpler one than that in WORK, and applied to the Britannia Co.; but my mechanical ardour was somewhat cooled by their estimate of 30s. for making it. Now if your readers could point out where such small commissions in engineering work could be executed at a reasonable rate, they would be conferring a boon on your wood-working section."

Fretwork Designs in WORK.—A. O. W. (*Ripon*) writes:—"I am requested to complain to you that you have never, since the first number of WORK, put any fretwork designs or anything about the same in your paper, and I have some customers giving up taking the paper on this account."—[When complaints are made they should, at all events, be based on some semblance to fact, if not on fact actual and positive. Kindly refer your customers to the Index to Vol. I. of WORK, which you, as a newsagent, know, or ought to know, can be supplied to them for one penny. Let me help you further by giving, for the instruction and edification of yourself and your customers, the following extract from the Index:—"Fret cutting, 46, 62, 93, 94, 126, 134, 157, 215, 236, 237, 238, 267, 316, 332, 349, 524, 535, 588, 638, 651, 667, 700, 747, 748, 765, 828; Patterns for, 77, 268, 302, 349, 429, 540, 652, 731; Wood for, 253; A cabinet for, 1, 110, 157, 172, 188, 747, 798."—ED.]

Fret Saw.—F. T. (*London, N.*) writes:—"In 'Shop,' No. 53 of WORK, I see a letter from W. E. C., describing the wire thread fret saw as worthless. I thoroughly endorse what W. E. C. says about them. I, like W. E. C., am very much interested in fretwork, and sent seven stamps for a sample dozen of the saws. I could not understand when I fixed them in my machine why they kept breaking so quickly, and I soon found out that it would not do to buy them: it would make the work come too expensive, besides a lot of filing when done. I have used for some time past Griffin's saw blades, which may be had from Messrs. Charles Churchill & Co., 21, Cross Street, Finsbury, E.C., at threepence per dozen; these saws cut much quicker than the ordinary saws."

II.—Questions Answered by Editor and Staff.

Authors' Manuscript Paper.—J. H. T. S.—Authors use paper of various sorts to suit their convenience. The ordinary note paper opened to a single sheet often serves, and is a useful size for editors, printers, and readers to handle; price about 6d. per lb. Some use ruled foolscap: 6d. to 9d. per quire. Some manuscript books, about 7 in. by 7 in., either plain or with ruled lines; about 1s. each. One side of the paper only to be written on. For a continuous story, this is as good a form of paper as any, and the reader is not annoyed by sheets getting wrongly placed, or having to adjust them in putting away. If the story is in a book it has a better chance of being returned, and may then be submitted to another editor if rejected by previous ones. Some authors take great liberties with editors in writing on the blank side of circulars, or any plain paper that comes to hand This is hardly respectful, as it gives trouble to gentlemen who have plenty to do and think about without having to hunt up numbers in creased sheets and make out awkwardly-written matter. Those who do these things are generally careless writers; printers and readers also are taxed in their time by such shiftless methods, only excusable by being away from paper shops or to meet an occasional emergency. There are many little matters which a writer should know before he begins to write his story. If in a book or loose sheets, leave an inch space from the edge of the paper at the beginning of each line and half an inch space at the end, so as not to have the writing crowded; let each word stand well apart from every other word. Avoid the use of capital letters where not wanted; put in stops to the best of your ability. Story writing is not difficult; that is why the press is flooded with it, and, when done, how few are worth reading. Technical writing is difficult, as the writer must be a worker to tell plainly how things are done in a way to be comprehended by all readers, tyros as well as experts. Faraday was a poet, but, wisely or unwisely, never published his rhyme. His scientific writing will live for ages.—J. C. K.

D Dulcimer.—H. M. L. (*Coatbridge*).—The method of tuning the D dulcimer is identical with that of an F, as shown in WORK, page 615, Vol. I., or one in any other key, the difference being solely in the pitch of the instrument itself, that is to say, no matter what key the instrument stands in, the lowest note is always called G. The actual notes on a "D" would be, if tuned to a violin or piano, 1 D, 2 E, 3 F sharp, 4 G, 5 A, 6 B, 7 C sharp, 8 C flat, 9 D sharp, 10 F flat; these are the brass strings. The steel strings on the right are 1 D, 2 E, 3 F sharp, 4 G, 5 G sharp, 6 A sharp, 7 C flat, 8 D sharp, 9 F flat, 10 G sharp; the steel on the left of the bridges, 1 A, 2 B, 3 C sharp, 4 D, 5 E, 6 F sharp, 7 G, 8 A, 9 A sharp, 10 B. The thickness of belly for D dulcimer should be ¼ in. when finished, not ½ in.—R. F.

Turning Draughtsman.—DRAUGHTSMAN (*Liverpool*).—To turn draughtsman, you first prepare a cylinder or roller of wood of the size of the outside diameter of the draughts; this you drive into a turned recess in chuck made of hard wood, so that about ½ in. enters the chuck and about 4 in. of the prepared cylinder projects; by running the lathe round and tapping the wood with a hammer, you can get it to run quite true, and practised turners do this very quickly. Having the wood thus held, you can smooth and ornament the top and cut off the draughts one by one with a parting-tool, which will leave the bottom quite smooth and slightly dished.—F. A. M.

Index to WORK.—D. O. W. (*Ipswich*) and numerous other readers are again informed that an Index is prepared and has been on sale for some time as advertised in No. 52 of WORK, and can be had from any bookseller or from the publishers, price 1d.

Electric Tables and Scientific Degrees.—HALFWAY (*Newcastle*).—I have already more than once explained the meaning of the terms "ampères," "volts," and "ohms." Tables showing how to work out calculations involving the use of those terms may be found in Molesworth's "Engineers' Pocketbook," and in Maycock's "Practical Electrical Notes and Definitions;" the latter is published by E. & F. Spon, price 2s. The letters M.I.M.E. mean Member of the Institute of Mechanical Engineers; M.I.C.E. mean Member of the Institute of Civil Engineers. The office of the former is at 10, Victoria Chambers, S.W., and of the latter at 25, St. George's Street, S.W. A letter of inquiry, enclosing stamped addressed envelope, to each or either of the secretaries of those societies will bring you information respecting terms of membership.—G. E. B.

Solder.—J. R.—It is scarcely necessary to give addresses where to procure tinman's solder. If J. R. will tell me of any good ironmongers who do not keep it, I will put their names down in my note-book of curiosities. The tin used in making it is called block or ingot tin. Full particulars of solder, and the mode of making it, are to be found in No. 17 of WORK, in the article entitled "Soldering."—R. A.

Clock Materials.—YOUNG WATCHMAKER.—I am sorry to say I can give no information as to material, shops, prices, etc., although I should think everything could be got as easily as here. At the same time, I have heard that goods and materials are dearer there than what we can get them here—I mean clocks, watches, and their parts—but for the

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truth of it I cannot answer. The only advice I can give would be to apply to the makers for the addresses of their wholesale agents, or the nearest one to where you settle. By that you would be able, no doubt, to get any or everything you required. For my own part, I don't think I should take anything but tools and cash, and see when I got there what I should be likely to want. I would gladly advise farther were I able.—A. B. C.

Organ Pipe Decoration.—BOURDON.—Zinc pipes must first be well cleaned with turpentine and then given one or two coats of oil paint till the pipes look thoroughly glossy. A coat of paint thinned entirely with turps is then laid on, and this will produce a flat or dead surface for the ground tint whatever colour is used. The desired ornaments are then drawn or stencilled on in dead colour. The ornaments may be drawn on thin paper, the back of which is then chalked and folded round the pipe. If the outline is then gone over with a pointed stick like a lead pencil, the pattern will be produced on the pipe, and can then be filled in with the requisite colours. Gilding is done by first painting in the ornament with oil gold size, and then when the size has become nearly dry (which will take some hours), and feels first a little tacky or sticky, the gold leaf is applied and the surplus cleaned off with cotton-wool. You will find the transfer gold leaf the easiest to use, as this is sold in books attached to thin paper which can be cut up to the requisite size with scissors and applied with the greatest ease; no waste or rumpling up is incurred. It is usual to pounce the surface of the pipe with powdered chalk so as to prevent the gold leaf adhering, except where the size has been applied. Gilt ornaments are also usually outlined in white, vermilion, or black lines after the leaf has been applied. For ground colours of pipes, chocolate, vellum, sage green, or pale blue look very nice, and can be adopted according to taste or suitability to the surroundings of the instrument. Care must be taken to graduate the size of the ornaments according to the size of the pipes on which they are placed, also to secure that they shall be drawn centrally on the pipes.—M. W.

Book on Organ Pipes.—F. C. (*St. Austell*).—The best, simplest, and most complete guide for amateurs is "Organ Building for Amateurs," price 3s. 6d., of Messrs. Ward, Lock & Co., London. A smaller work containing a good deal of useful rudimentary information is that called "Practical Organ Building," price 2s. 6d. (Crosby Lockwood & Co., London).—M. W.

Wind to Pipes.—ORGAN (*Manchester*)—The trumpet-shaped metal pipes in the steam organs seen at fairs and circuses are, I believe, simply reed organ pipes voiced to suit the requirements of the case. And they are sounded by the wind passing through them in the same way as in any ordinary concert organ. The only difference is that they sound more coarse and blatant than the reed pipes of an organ in a concert hall.—M. W.

Enamelling Bath.—F. D. (*Manchester*).—To remove the grease, dirt, etc., from your bath, make a strong lye of soda, say, 2 lbs. to a pail of water, and well scrub it out with this, or dissolve three packets of Hudson's extract of soap in a pail of hot water, and use in a similar manner. This will effectually remove all grease and dirt. It would certainly make the best job to remove all the old japan or enamel; but if you do not wish to go to that trouble, rub it well down with pumice stone or glass-paper. Wipe all the dust, etc., that the rubbing makes carefully out before commencing to enamel it, and do the job somewhere where it will not get any dust on whilst drying. To make a good job it will want three coats. After giving the first coat, let it stand for one day. After it is dry, before applying the second, let it be two days between the second and third coats. This will ensure each coat getting thoroughly dry and hard before the other is put on, a most essential point. Wipe round with a sponge and cold water when the third coat is dry, and let it stand for a day or two before using. As you will get no paint or enamel yet made to equal the stoved japan that is put on new baths, a hint as to the method of using a re-enamelled bath may be of service. It is this: never put boiling water into the bath; put in first a quantity of cold water, say, about half what you think you will require; then add hot water to your requirements, and cold afterwards as needed. By this treatment you will preserve the enamel three times as long as if you did put the hot water in the bath first.—R. A.

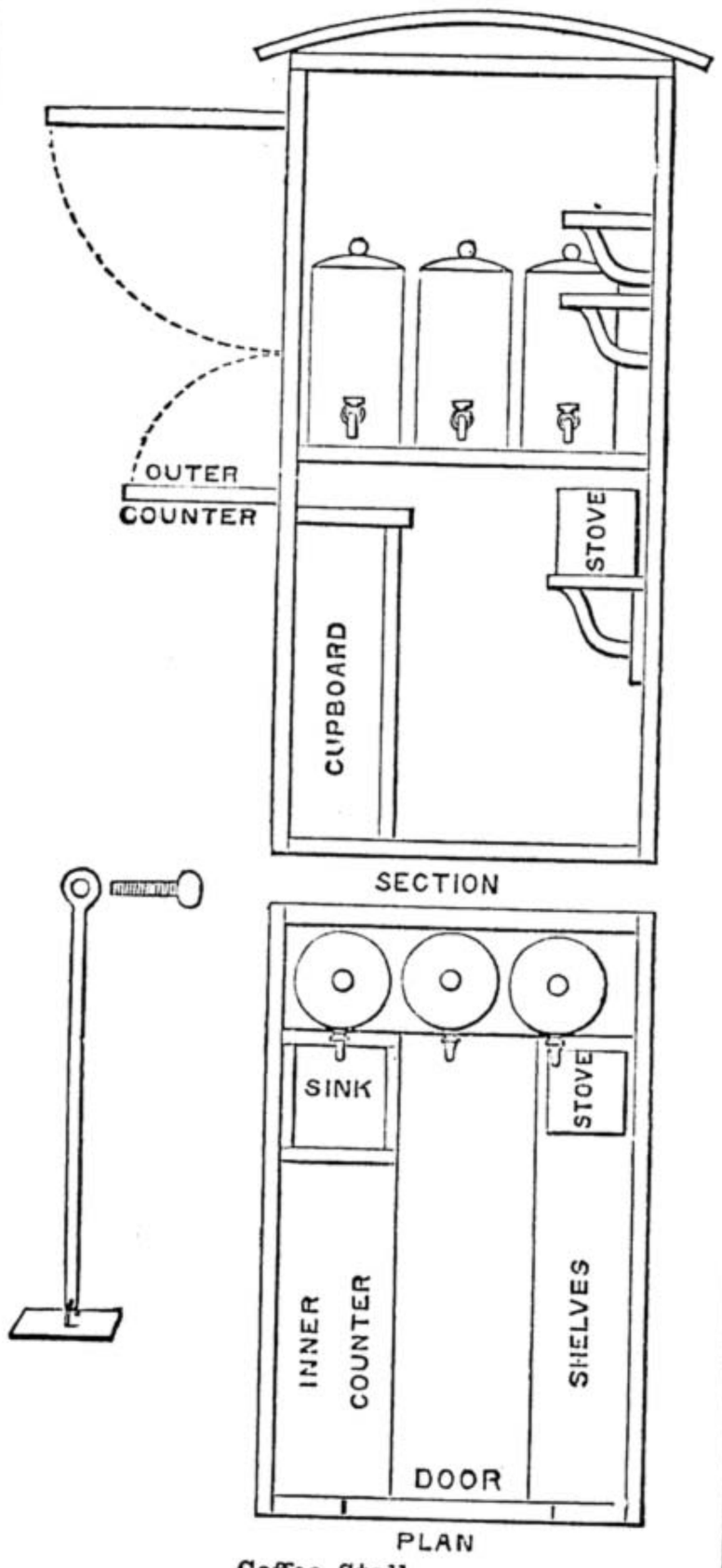
Brass Solder.—J. J. P. (*Malton*).—You should be able to procure this at any respectable ironmonger's under the name of spelter. The following firms supply it wholesale, and would probably supply you with some if a courteous request were made to them:—Warner & Sons, Crescent Foundry, Cripplegate, London; Benham & Froud, Chandos Street, London; Pontifex & Wood, Shoe Lane, London; Lewellyn & James, Bristol.—R. A.

Box Die Tool.—LAMPMAN (*South Wales*).—What you want is an oval combination die or top and bottom tool, but I fear you would find it an impossibility to make it yourself; it would necessitate the command of a forge, anvil, vice, files, and also a considerable amount of technical skill and nice fitting. The best advice I can give you is to send a sample of the work you want to produce to Rhodes & Son, Wakefield, Yorks., who make a speciality of such tools, and who would supply you with one at a far less cost than would be the case if you attempted it yourself.—R. A.

Hydraulic Punch.—RELIOB (*Hebburn*).—I do not think you could get better served by any other firm than that you name, and to make a hydraulic punch you would find a very troublesome job—all hydraulic is unless you have special tools at hand. You might pick up a cheap machine by advertising for a second-hand one. A screw press with a quick threaded screw and fly-weights (like a coining-press) might answer your purpose, and would be much easier to make than a hydraulic. A toggle-press would give the pressure required, but not the travel with it.—F. C.

Back Numbers of WORK.—T. G. N. (*Keighley*).—All back numbers and parts of WORK can be obtained of the publishers, Cassell & Co.; Limited, London, E.C., should your bookseller be without them. The literary matter of the numbers and parts is precisely the same, each part being made up of four and sometimes five numbers.—ED.

Coffee Stall.—PLEASURE AND PROFIT (*London, W.*).—This stall can be made in pieces, and put together like the "Stall for covered market" (see No. 36, p. 574). The specially useful feature of this sketch is the opening of the front to form counter for customers, and a roof for them as well (see dotted lines). A couple of jointed rods with thumb-screws would support the extended roof as well as fix it when stall is closed. Chains of suitable lengths would support counter like a tail-board of a van. A



Coffee Stall.

lined case, like a small cistern, forming a sink and washing tray, would be a great convenience; and shelves on back of stall, with clean cups, plates, saucers, and glass cake and confectionery jars, would help make it attractive. A stove might be added, and should be like a miniature kitchener, such as the Duet American Kitchener, burning coke or charcoal, and having an iron chimney, which could pass under coffee urns which rest on iron rods. A door would be in one end, which is suggested but not drawn.—B. A. B.

Clock Bushes.—J. J. (*Orkney*).—Clock bushes or bouchons may be bought at the tool shops—Morris Cohen, Kirkgate, Leeds; Grimshaw & Co., 35, Goswell Road, Clerkenwell, London, etc., in all sizes, in packets of 100, suitable for French clocks, or timepieces, and carriage clocks, at 1s. 6d. per packet, and larger sizes, suitable for English clocks, at 2s. or 3s. per dozen, in lengths of about two inches. Having an assortment of these, select one that will take the pivot for size, not actually take the pivot in the hole, but that shall be large enough to take it and allow a fair margin for wear; as a rule I select one double the size of pivot. Now with a broach open out the old hole till the new bouchon just enters, chamfer slightly the inside part of the hole and more deeply the outer end, cut off the bouchon a trifle longer than the straight part of the hole, chamfer one end—the outer one—and file the inside end of the new bush and drive in from the inside part of the plate (I ought to have mentioned that the plate should have been brached from the inside part of it). When driven in nearly level with the inside of plate, rest that end on a flat stake or the face of a hammer; take a round-face punch and rest in the chamfered end of bush and give one or two sharp blows, which will spread the end of bush out over the chamfered part of plate and hold it in tightly. Now take a broach and open out the bush till the pivots fit in nicely, and finish off with a round or burnishing broach to make it nice and round and smooth. If you cannot get the hollow bushes, you can open out the hole in plate about double the size; chamfer both sides, and fit in a solid piece of brass wire, rivet it tight both sides, and drill hole through. But in that case you had better mark with compasses a part of a circle, just cutting the centre of old hole, from two opposite or right angle places before braching out, and again after stopping the hole; then make a centre dot just where the lines cross, otherwise you will get your depths wrong. I trust you will succeed from the above hints.—A. B. C.

Telephone.—F. J. H. (*Bristol*).—You need not at any time be afraid to ask questions in "Shop," nor, after having asked them, apologise for doing so, for we are always ready and willing to answer any question which may be asked. Still, although we are always willing to answer in such a manner as will be helpful to the querist, there are times when it is almost impossible to do so. There is an old proverb which runs somewhat in this way:—"Heaven helps those who help themselves." So, speaking for myself, I feel readier to help those querists who seem to be ready to "put their shoulder to the wheel" and shove past the difficulty rather than those who, when they meet a seeming difficulty, sit down and look at it and make no further effort. Now without indicating even by a hint to which of the two classes you belong, I will proceed to answer your questions. In the first place, "the top or cap, as it is called," is not constructed as you have indicated by your sketch, but is simply a piece of wood turned to shape as shown in Fig. 5, page 441, Vol. I. Now for your "little difficulty." You can't "make out why the two wires branched off in different directions, and why one is marked 'to earth' and the other 'to line.'" Well, this simply means that one wire is joined to a gas or water pipe, or something that will give you a good earth connection, and the other to the line that goes between the two instruments. That is simple enough and easily to be understood, not much difficulty about it. Look carefully at Fig. 2 on page 441, and read paragraph 4 on page 439, a portion of which you quote. I cannot make it plainer. Your difficulty lies in this (whisper, I don't want everybody to hear) —*you thought* that the wire marked "to earth" went to a battery underneath the telephone. Will you kindly allow the writer to *think* for you and do exactly as he tells you and you will find no difficulty at all. The reason why wires are joined to earth in electrical circuits is because the earth acts as a return wire, and thus saves the expense of using two wires. The most common way to make these connections is to carry a wire to the nearest gas or water pipe or to a metal plate sunk in damp earth. When two instruments made according to the directions given, and represented by Fig. 1 on page 440, are joined up together, as shown at Fig. 2, *no* battery is required for the reason given in paragraph 4. But when a microphone is introduced into the same circuit a battery is required, and the method of connecting is shown at Fig. 11. I cannot take up further space in this column. I thought that the article on the telephone was so plainly written that the merest tyro could understand it. You will notice that the answers to your questions are really the words already given there. The instrument described is quite different, in a sense, to the one which is in use by the firm in whose service you are. The last paragraph in the article under discussion indicates as much. I may yet give instructions which will enable the amateur to make such a set of apparatus. Just take up No. 28 of WORK and read the article over again, and if you decide to make the instruments, make them and use them exactly as the description, and your attempt will not prove a failure.—W. D.

Ebonite.—H. F. M. (*Dewsbury*).—Ebonite is made by kneading indiarubber between rollers and incorporating with it *half* its weight of sulphur. The mixture is then exposed for a couple of hours to a temperature equal to that of boiling water. It has, we believe, to be moulded at a great heat, and under heavy pressure, the apparatus required placing the work beyond the reach of the amateur. The soft vulcanised rubber used for stoppers, which, perhaps, H. F. M. confounds with the above, is kneaded, etc., in the same way, but the proportion of sulphur is smaller.—S. W.

Painting Brougham.—YOUNG COACH PAINTER.—Nothing has been found yet by coach painters to beat best Japan gold size as a preparation to commence painting upon on new leather work. When the trimmer has finished putting the hide upon the brougham, it should stand at least a week in the warm paint room to dry before it is touched, as the paste under the hide keeps it damp when apparently the outside looks quite dry. During the time of drying and when dry, do not let any one rub their open hands unless quite clean on the leather, as a hide is, or supposed to be, greasy on account of oil colour never drying upon new leather, unless coated with gold size preparatory to painting. When you commence to give its coat of size take my advice

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and do not have the room too warm. Commence by giving the top a coat first, then the two top side quarters, and afterwards the top back quarter, with a large brush so as to enable you to get over the ground quicker. If the size soaks into the leather and looks patchy it will not matter, as it is no detriment to it. You will find that you will have to be sharp and handy in using your brush, for gold size soon sets, especially in a warm room. When the size has been on the leather twenty-four hours you can give it its first coat of lead colour.—W. P.

Casting a Figure in Plaster.—W. E. C. (*Londonderry*).—If the "modelled figure 30 in. high" is in *the round*, the mould will have to be made in two or more pieces. Where the line of separation between these pieces may best come must depend on the pose of the figure, but generally the mould will be formed in *front* and *back* halves. Make a parting along the line of separation with slips of zinc an inch wide by sticking their edges into the clay of the model. Say that the *back* half of the mould is first made. Mix the plaster as thick as cream, and throw it over the model, as far as the zinc parting wall, with the hand or a spoon till a thickness of ¼ in. is reached. It is well to tinge the water with which the plaster for this inner mould is mixed with some colouring matter—say ink. Wait five minutes for the plaster to set, then brush it over with a mixture of clay and water as thick as pea soup. This is to cause this inner mould to separate from the outer one when required. Then mix plaster for the outer mould with *plain* water and throw it over the inner mould to a depth of ¾ in., imbedding in it pieces of thin bent iron rod to strengthen it. The back portions of mould being thus finished, when it has set, remove the slips of zinc, and in the edges of the mould thus left exposed, bore at intervals conical holes. These, with the corresponding projections which will be formed in the front part of the mould, will serve as keys to ensure the accurate fitting together of the two parts. Brush clay water over the exposed edges, and make the second half of the mould in the same manner as the first. When the whole has set, the two halves can be divided by inserting a chisel at the line of separation. The clay water will prevent their adhering too firmly together. As the chink between the two begins to open, a little water poured in and gentle working of the parts to and fro will help the separation. Remove the clay off the model and well wash out the mould with soap and water. Lash the pieces of mould tightly together, and pour in the plaster to form the cast. Move the mould about so as to let it flow equally over every part. Strengthen with copper wire where required. When the cast is set chip off the mould with *blunt* chisel and mallet. The outer mould can be removed by a few strokes; the inner (tinted) mould must be broken off with more care; its colour will cause it to be easily distinguished from the white cast. Parts of the figure which project much, such as the hands in some positions, it is often desirable to cut off, cast separately, and stick on again. If the model is in *relief*, a mould made in a single piece will generally suffice. I trust that the Editor of WORK may before long be able to afford the space for an illustrated article on "Casting in Plaster," in which I shall be able to explain processes far more thoroughly and clearly than is possible in a mere paragraph of "Shop."—M. M.

Winding Dynamo.—F. H. W. (*Wolverhampton*).—If you wind your F. M. cores 4 in. × 3½ × ¾, with 3¼ lb. No. 16 c.c. wire, and the armature 3¾ in. × 1½ in. × ¾, with ½ lb. No. 20 s.c. wire, and drive the machine at a speed of 1,600 revolutions per minute, you will probably get a current of 3 ampères at a pressure of 12 volts, or enough to light up a 5 c.p. 12-volt lamp. If you wind the F. M. cores with 4 lb. No. 22 d.c.c. wire, and the armature with 5 or 6 oz. of No. 22 d.c.c. wire, and drive at a speed of 3,000 revolutions per minute, you will get enough current to light up a 25-volt 10 c.p. lamp. For charging electro-magnets, you must use a current suitable to the winding on the magnet cores. If the cores are wound with many turns of fine wire, you must use a current with a high E.M.F. to fully magnetise the cores. This is ensured by winding the armature of the machine with fine wire and driving it fast. On the other hand, if the cores are wound with thick wire, the E.M.F. of the current may be low, and a machine wound with large wire will then serve the purpose.—G. E. B.

Pattern Making.—A YOUNG PATTERN MAKER.—You will make the core box precisely as you would for a spur wheel, except that the helical teeth would be substituted for spur wheel teeth. As you do not ask for the methods of striking and working the teeth themselves, I presume you are familiar with those methods. If not, I will describe them on the repetition of the question. As this would involve a column of letterpress and several woodcuts, I will not burden our columns with it, unless explicitly asked for.—J.

Malleable Castings.—CASTINGS (*Poplar*).—Write to Harrison, Malleable Iron Works, Lincoln. The price of the castings should range between 4d. and 5d. per lb. I think you could mark the article "Patent," but write to the Patent Office in Chancery Lane, E.C.—J.

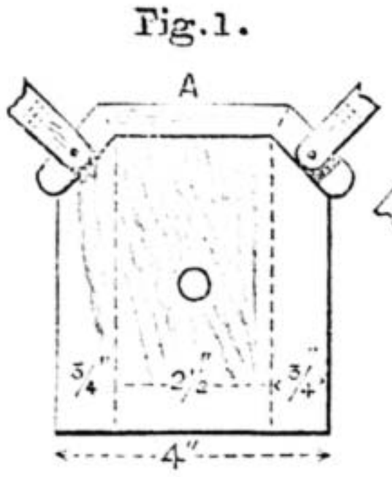
Index to WORK.—A. McN. (*Belfast*).—An exhaustive Index to the first volume of WORK is on sale of Messrs. Cassell & Company, Limited, and every bookseller.—F. J. C.

Deafness.—AURAL (*Aberdeen*).—Much obliged, but we do not answer any queries relative to medical or surgical matters.

Back Numbers of WORK.—A. S. (*Stamford Hill*) and many other inquirers are informed that back numbers and parts of WORK from the commencement are obtainable through any bookseller, or through Messrs. Cassell & Company, Ludgate Hill, London, E.C.—F. J. C.

Music Stand.—J. H. S. (*Stockport*).—I am sorry you have had to read and re-read my music-stand article a score of times—literally speaking, that means you have perused it forty times!—and have at last had to give it up. But I am sure that if you had examined the engravings rather more closely, it would have been quite clear to you. As it is, the last paragraph on page 552 is quite correct, and if you read the first paragraph on page 553, and look at the inscription under the fretwork panel on the same page, you will find that no mistake is made. To answer your query, however, I must give a few diagrams. Figs. 1 and 2 represent that portion of the stand on to which the shaped piece (Fig. 6, page 553) is hinged, and the end of side rail on movable frame. The frames are

Fig. 1.



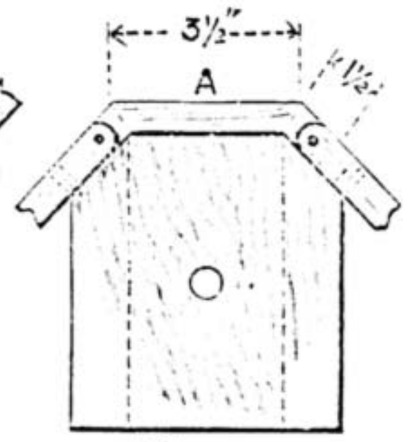


Fig. 2.

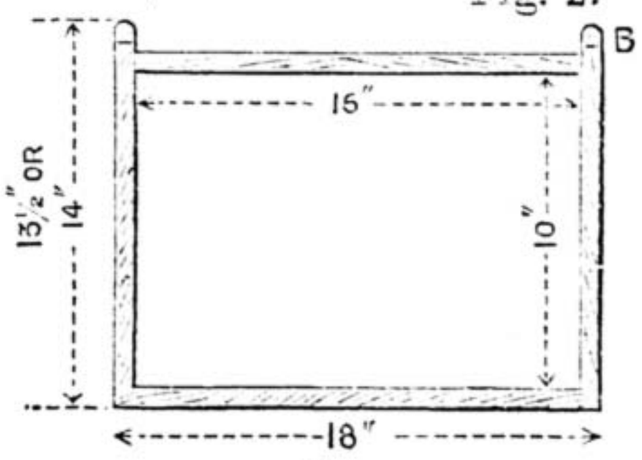


Fig. 3.

Music Stand.

fastened (at B in Fig. 3) by pivots to the sloping pieces on each side of A in Figs. 1 and 2. The plain portion above music book in Fig. 4 is to be rather Irish, not plain, but slightly shaded to show that it is entirely distinct from the whole-shaded piece above it.—J. S.

Basket Making.—J. T. (*London, E.C.*) asks if there is any book published on basket making. I may say in reply that I believe there to be no such publication in existence. Some years ago I came across a book, the title of which I do not now remember, in which there were some two or three pages devoted to the subject; that is the only scrap I have ever seen or heard tell of. With respect to the further inquiry, I may say the Editor has asked me to write on the subject, and I have consented, as soon as my business makes a rather less demand upon my time. In the meantime, if there is anything J. T. wishes to know, I shall be most willing to assist him through the columns of "Shop."—W. S. B.

Harp Regulating.—HARPIST (*London*).—I should strongly advise HARPIST not to attempt any regulating of the action of his harp, but to send it to a competent repairer, who will do it thoroughly and save him no inconsiderable amount of trouble, and probably expense. The mechanism of a harp, and especially of a double-action one, is of such a complicated character, and so many different causes will produce the same effect, viz., the "buzzing" of which HARPIST complains, that it is safer, especially if the instrument is valuable, to have it done by a properly qualified tradesman. If, however, HARPIST thinks himself capable of undertaking the job, and does not mind risking the chance of making bad worse, I will endeavour to explain how he may find out the cause of "the forks not pinching the strings tightly," and how to remedy it. Running down the inside of the column of the harp, from head to pedestal, are wire rods which connect the pedals to the metal squares in the head, and these are in turn connected to the jointed flat rods which fill the interior of the neck between the brass plates; and these, in their turn, are connected by arms or levers to the pivots on which the forks are fixed. All harps, however, do not work in this direct way, different makers adopting different methods to attain the same end, but the principle is the same. The forks in HARPIST'S case do not turn sufficiently, and this may be due first to the pedals being bent; second, to the pull-down rods having become worn in the holes at top or bottom, thereby rendering them a little too long; or, third, to the arms or levers which work the fork-pivots having become bent. In the first instance, press down the pedal and ascertain if only one or all the sets of notes acted upon by that pedal are affected; if all, the fault lies in the pull-down or the pedals. Lay the harp down, and take off the bottom by unscrewing the nuts or screws which hold it in its place; then examine the pedal to see if it is bent down; if found to be so, take it off by removing the spring and taking out the screws of the pull-down and hinge at the front, then get the pedal straightened and connect up again. 2nd. If it is not bent, after removing the springs and the screw of the pull-down, grasp the latter *tightly* with a pair of pliers just above the union, and turn this union to the right one whole turn, then replace screw, spring, and pedestal and try it. Do not give more than one turn to the union before trying it, as you otherwise may couple it up too tightly, and in pressing down the pedal again may break or strain the action. 3rd. If only one note of the set is faulty, then the evil is in the action itself, and it is hopeless for an amateur to attempt to remedy it.—R. F.

Silver Test.—J. P. (*Liverpool*).—Silver can be obtained in commerce almost pure, but, on account of its softness, a little copper is added to it when used for bullion, coin, or domestic purposes. The standard silver of England contains 111 parts of silver and 9 parts of copper. Dissolve a small piece of the silver in nitric acid; if it contains copper the solution will have a blue tint; gold will remain undissolved as a black powder. To the clear solution add hydrochloric (muriatic) acid, when all the silver will be precipitated as chloride, along with mercury or lead if present. Boil, allow the silver chloride to settle, decant off the liquid, A, and wash well with boiling water. Warm the precipitate with ammonia, which dissolves all the silver chloride but leaves the lead unchanged and turns the mercury black without dissolving it. This and the blue coloration mentioned above are probably all you require; but, if you suspect your silver to be very impure, you may test further by diluting the solution, A, with water and passing a stream of sulphuretted hydrogen through it. No coloration or precipitate, even on warming, shows the absence of lead, mercury, copper, bismuth, tin, antimony, and arsenic. But if on warming there be a precipitate, filter from the solution, B (to which I shall refer again), and wash well. Boil the precipitate with either potash solution or ammonium sulphide, and filter if necessary. The residue, C, may be lead, mercury, copper, or bismuth; and if, on adding hydrochloric acid to the filtrate, a precipitate, D, be formed, this may be tin, antimony, or arsenic. Add strong nitric acid to the residue, C; evaporate nearly to dryness, and add dilute sulphuric acid: a white residue will denote the presence of lead, and a black one that of mercury. Filter and add an excess of ammonia to the filtrate; a precipitate denotes bismuth and a blue coloration copper. The precipitate, D, of tin, antimony, or arsenic is redissolved in strong hydrochloric acid, cooled, and poured into a small flask containing pieces of pure zinc lying on bright platinum foil. The flask should be fitted with a cork, through which passes a piece of glass tubing, drawn out to a fine jet. Light the gas issuing from the jet, and allow the flame to play on the cool surface of a piece of clean porcelain; if a black stain be formed, arsenic is present. Examine the platinum and pieces of zinc in the flask: a black stain on the former is due to antimony, and on the zinc to tin. Now return to solution, B; boil off the sulphuretted hydrogen, evaporate to dryness with a few drops of nitric acid, and redissolve in dilute hydrochloric acid; any residue will be silica. Add ammonium chloride and ammonia and boil: a precipitate will be iron (chromium or aluminium); filter if necessary, add ammonium sulphide to the filtrate and boil. A black precipitate will indicate cobalt or nickel, a light pink precipitate manganese, and a white one zinc. Fuse the black precipitate with a little borax: the bead will be blue if cobalt be present, but brown or yellow if nickel. By this method you can test all silver ores very easily and rapidly, as it does not take so long as might be thought from the description thereof.—F. B. C.

Duchesse Table.—A. B. C. (*New Brompton*).—This subject will receive due attention, but a design cannot be given in the "Shop" columns, where it would be very little use to most of our readers without a detailed description of construction. I congratulate you on your success with the sofa you have made.—D. D.

Sideboard Decoration.—G. R. M. (*Greenock*).—I must ask you to explain more fully what you mean by "textile work." There are so many textile fabrics that it is quite impossible to give the information you require without knowing to which one you refer, if, indeed, you refer to any special make. If you do not, I think you would find tapestry or Utrecht velvet suitable, though I do not understand what parts you call "the corners." Both the materials named can be got from any good cabinet maker or upholsterer. The values vary so much according to quality that it would be useless to quote prices, which can be got from the person supplying you.—D. D.

Glass Polishing.—A. H. (*Edinburgh*).—Without the practical experience which you lack you would find it a most difficult matter to block out scratches on glass plate. If you are inclined to try you may do so by what may be called grinding or rubbing

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down with such powders as pumice and finally polishing. The spots you refer to are probably in the silvering and not in the glass. If they are in the glass it will hardly be worth while going to the expense of resilvering. As I presume you are not going to do the silvering yourself, you can instruct the silverers to block out the scratches. If the plate is worth silvering do not grudge the small extra cost of removing the scratches.—D. A.

Polishing.—T. W. (*Rotherhithe*).—Glazing is a method of finishing polished work, and is used as a substitute for "spiriting" after "bodying in." You may as well buy the glaze. It is sold at the same places as polish. If you prefer to make your own, you can easily do so by dissolving gum benzoin in methylated spirits, in the proportion of one to two or thereabouts in bulk. The gum must be crushed small, and the mixture be filtered before using. Apply the glaze with a soft brush or rubber.—D. D.

French Polish.—BEGINNER.—French polish is made by dissolving shellac in methylated spirit, but you can buy it about as cheaply as you can make it. If you want to do this put, say, 6 oz. of shellac in a pint of spirit and wait till the shellac is dissolved. Further particulars will be given in articles on polishing.—D. A.

Rebating or Rabbeting.—BEGINNER.—From your remarks about the difficulty of rabbeting, I suppose you have never seen a rabbet plane used by any one accustomed to it. If you can get a friend to show you how to use it you will find there is really very little difficulty in cutting a rabbet, but in case you cannot I endeavour to describe the operation briefly. Mark the width of the rabbet with a cutting gauge, with which I presume you are acquainted. Guided by the cut so made take off a little with a chisel. You then have a slight rabbet, and you will then have no difficulty in doing the remainder with the plane. It may help you to know that you should keep the tips of the fingers of the left hand slightly under the plane in order that they may act as a guide. The plane of course is held when in use with the left hand in front of the iron, so the ends of the fingers are quite naturally in the required position. It is not the invariable practice to use the chisel before the plane, but you may as well do so, till you are able to dispense with it. I am almost afraid that you have made the frame before cutting the rabbet. If you have, reverse the operation with the next one you make and do the rabbeting first.—D. A.

Lead Chucks.—BEGINNER.—I am pleased to hear you have managed so well with your lead chucks, but unless there is something special about them I am afraid it would be hardly worth while to describe them. However, if you care to do so any description sent to the Editor will have his careful attention. You will be able to get the castings made by any brass founder.—D. A.

Photography and House Painting.—The article on "Pinhole Photography" appeared in No. 17 of WORK. A good book on house painting is "House Painting, Graining, etc.," by Davidson, 5s. (Lockwood & Co.).—F. J. C.

Oak Wood Purchasing.—AN AMATEUR.—Oak ready planed for use can be bought at most of the timber yards in and around Curtain Road, E.C., at the following prices:—

Thickness	¼ in.	⅜ in.	½ in.	⅝ in.	¾ in.
Price	3d.	3½d.	4d.	5½d.	6½d.

per foot super. Try Latham, 124, Curtain Road.—A. J. H.

Lawn Mowers.—LOCO (*Colchester*).—Kindly send name and full address, that I may communicate with you respecting the proposal contained in your letter.

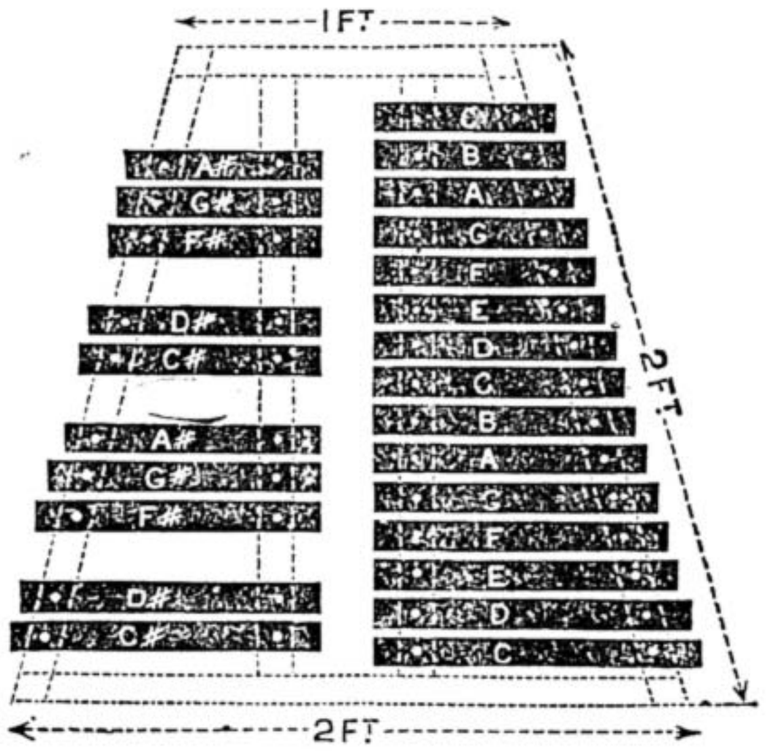
Cleaning Map.—CHIPMUNK (*Hull*).—Your mounted map will require taking up and relaying, an operation requiring great experience and tact; it is impossible to aid you by describing process, but any good print restorer, or even bookbinder, will undertake it at a very low cost.—F. B.

Sensitised Paper.—G. N. P. (*Aberdeen*).—Make a solution of seventy grains of ferricyanide of potassium in one ounce of water; in another ounce of water dissolve one hundred grains of ammonio-citrate of iron; just before use mix the two solutions. Pin a sheet of good white paper of even texture on a board and apply the mixed solutions to the surface evenly with a sponge or brush, until equally moistened all over, then dry in the dark. A yellowish-grey paper will be the result. Print under a negative until the detail is fairly out. Remove from the printing frame and immerse in water very slightly acidulated with hydrochloric acid. Wash for half an hour or so in several changes of water and dry. The chemicals can be found at any chemists, as they are in general use for other purposes. The ammonio-citrate of iron should be in clear bright scales, not clotted together; as this preparation is somewhat deliquescent it is necessary to keep it in a well-corked bottle.—E. D.

Warming Organ Room.—X. Y. Z.—A simple apparatus for keeping the organ room at an even temperature during winter can be made by placing a long cone or tube of metal over a lamp or gas jet. The metal soon becomes hot all over and radiates the heat over the room, and by adjusting the height of the gas jet the amount of heat can be regulated. A very small jet is all that would be required for a moderate sized room, as a large amount of heat is not necessary. A thermometer should be kept in the room, and about 50 degrees would be ample heat. The cone can be made of sheet iron, or preferably of bright tin-plate.—M. W.

Telephone.—J. K. (*Manchester*).—Your letter is quite a treat; I am sure the Editor will be pleased to learn that WORK is so helpful to you and men of your class. Personally I am very much pleased to be able to help you, and glad that you have taken an interest in my article on the telephone. You will find all the information you desire already given in WORK. I have described three different processes for magnetising steel bars for telephone magnets, any one of which you may use. It is quite possible for an amateur to undertake this piece of work, but I certainly would advise you to buy them. You will get them at any electrician's shop, of which there are many in Manchester. You should get a pair to suit your purpose for about 2s. If you cannot get them round, conveniently flat ones will do just as well. You need not trouble trying to get mahogany for the body; any kind of wood will do, either hard or soft—in fact a brush handle will answer the purpose. The first telephone I made had a body made with a number of plies of paper glued and rolled together; I only mentioned the mahogany because it is easy to work and looks well when finished. I hope you will be successful with your telephones. If I was nearer you I would like to help you personally. Write again if you want anything.—W. D.

Xylophone.—ANXIOUS (*Chester*).—The accompanying diagram will, I think, sufficiently explain the construction of the "Xylophone" or "Gigelira." The dotted lines show the frame ¾ in. thick. On this are fastened by wire nails the bands of straw 1 in. diameter. On these bands again are laid the notes made of wood and kept in their places by



Xylophone.

nails which pass through holes somewhat larger in diameter than the nails themselves. The notes as they approach the top of the scale are made thinner as well as shorter. The best wood to use for the purpose is rosewood, but very good results may be obtained from yellow pine or black walnut, but it is almost essential that all the notes be made from the same plank to ensure uniformity of tone. The beaters are made of boxwood, and are knobs of 1 in. diameter on cane handles 10 in. long.

Bookbinding.—AMATEUR (*Holloway*).—Bookbinders' cloth varies a great deal in price, according to the style of finish upon it, and also the colour, and, as I have never bought it in small quantities, I could hardly tell you what price the makers would retail it at. But I have sold many a yard to amateurs and small bookbinders, and charged them from 6d. to 9d. per yard. You will, however, get a fair piece, containing 36 yards, for 18s. Morocco also varies in price; a very good skin may be got for 8s. 6d. Amateurs can be easily cheated with morocco. There are so many imitations it is difficult to tell the real stuff when one does see it. I can always tell better by looking at the back; in fact, I always judge morocco by looking at the back.—G. C.

Engraving and Lithographing.—W. W. (*Kelso, N.B.*).—Both these arts require a course of instruction and education before they can be practised. Books on the subject, also on water-colour painting, are published by Messrs. George Rowney and Son, Rathbone Place, London, W. I think they cost 1s. each.—F. B.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—F. H.; N. M. (*Sheffield*); RELAW; A. C. (*Manchester*); C. J. (*Leeds*); J. S. (*Ashton-under-Lyne*); D. O. W. (*Ipswich*); X. E. A. (*Sheffield*); JUSTICE; CODGETO; AN AMATEUR; W. E. B.; L. B. (*Wells*); R. W. G. H.; CABINET MAKER; J. S. S. B. (*Dublin*); J. C. (*Scarborough*); KILDONAN; L. T.; J. A. W. (*Sheffield*); W. J. (*Wolverhampton*); H. S. M. (*Birmingham*); POLYGON; A. P. (*Manchester*); WATER (*Leeds*). DON; AN ADMIRER OF "WORK"; J. W. F. (*London, W.*); A. S. (*Paisley*); J. L. (*Wimborne*); E. M. H. (*Glasgow*); GOSFORTH; J. H. M. (*Meath*); G. R. D. (*Shipley*); J. S. (*Huddersfield*); DRY PLATE; TELESCOPE; CONSTANT SUBSCRIBER; TIN TICKET; DEW; DEMENTED (*Manchester*); PAPYRUS (*Petersfield*); AMATEUR STEREO; P. M. G. (*Glasgow*); W. S. (*Shipley*); E. B. (*Cheltenham*); J. E. (*Blackhill*); J. S. (*Longsight*); A. V. (*Cullompton*); ALBERT; E. A. P. (*Whitstable*); WOULD-BE WOOD CARVER; H. A. H. (*Chatham*); AHNUS (*London, S.E.*); FARDO; SEPTIMUS; W. W. A. (*Lanark*); E. M. (*London, N.W.*); J. K. (*Mile End*); MONUMENTAL MASON; THE VICTOR CYCLE CO.; CAROL; W. C. (*West Bromwich*); HELPLESS; W. H. Y. (*London, S.W.*); W. E. (*Heckmondwike*); H. E. A. (*Hackney*); STANNUM; STOKER.

Trade Notes and Memoranda.

THE first consignment of wood from Madagascar arrived in the London Docks recently, and excited not a little interest in the timber trade. The wood has been imported by the Madagascar Forests Company (Limited). The company has the concession for a forest extending over 1,600 square miles. The first cargo imported comprises 190 tons of hard woods, which the experts declare are suited not only for furniture and purposes to which mahogany is applied, but also for flooring and shipbuilding. One kind, of which the Madagascar name is arzovola, resembles walnut in colour and grain, and having a fine figure, should be valuable for cabinet work. The intention is to make regular consignments from Madagascar.

RECENTLY at the Ermont Works of the French Northern Railway, a curious electrical and mechanical instrument called a "Schiséophone" was tested with most satisfactory results. It indicated with marvellous accuracy the exact spot where interior flaws in the iron and steel were concealed, the proof being obtained by fracturing the rails to see whether the invention had really discovered the presence of defects not outwardly visible.

GLASS enamelled steel casks are being made in the States for use as filters in glucose and sugar refineries, evaporating tanks for salt works, and other purposes, and to take the place of the casks in breweries. They are said to be the finest specimens of enamelled steel work yet produced. The body of the cask is composed of a number of welded steel rings, four inches thick, with right-angle flanges at each edge. The heads are stamped from single sheets of steel in a powerful hydraulic press, and the inside is coated with a glass enamel, melted on to the steel at a high heat. The sections and heads are bolted together with ½ in. bolts, 2 in. apart, and the flanges are reinforced by continuous steel washers. The casks can be drilled at any point without chipping the enamel, which shows the tenacious union effected between the steel and the enamel.

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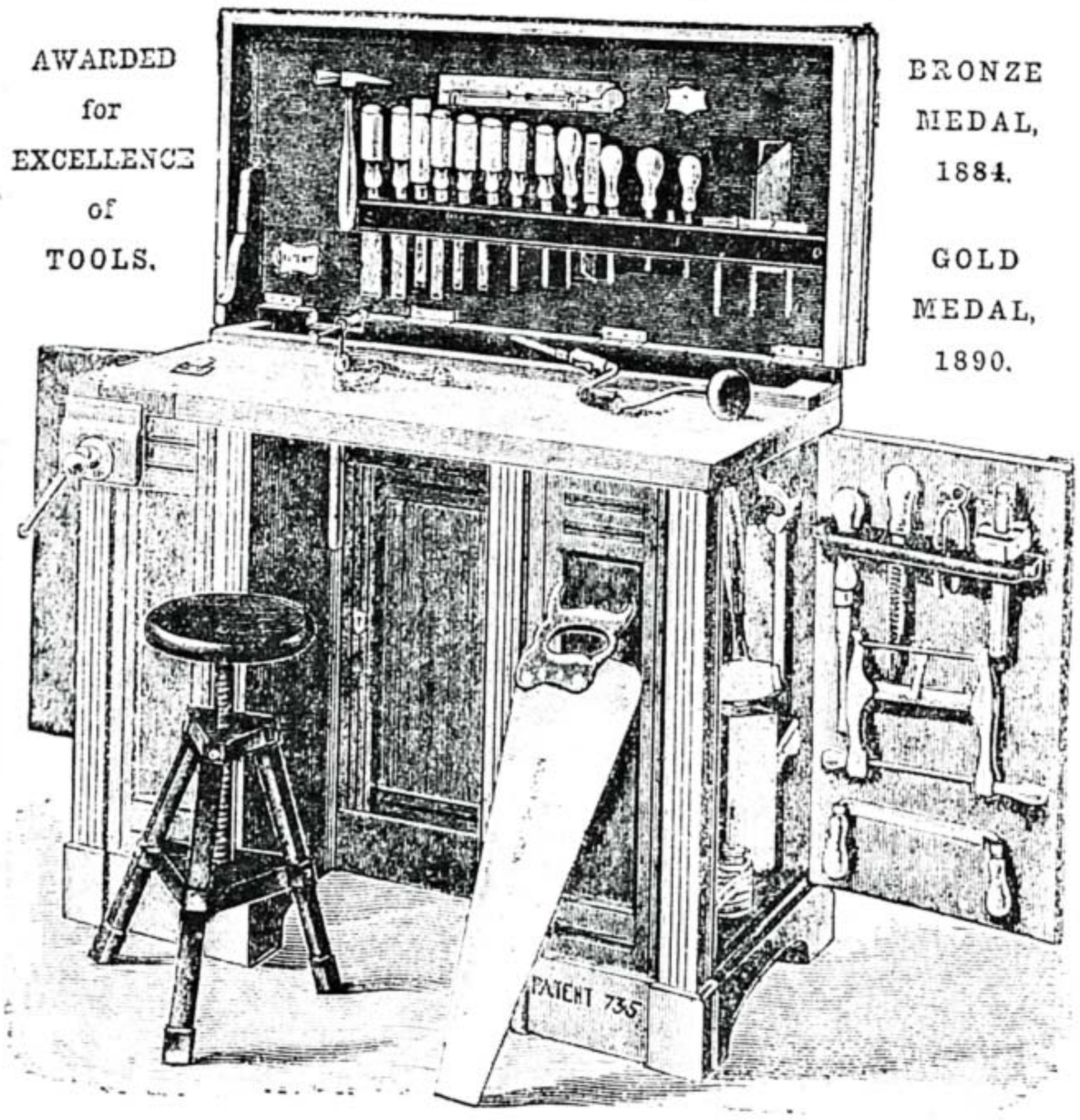

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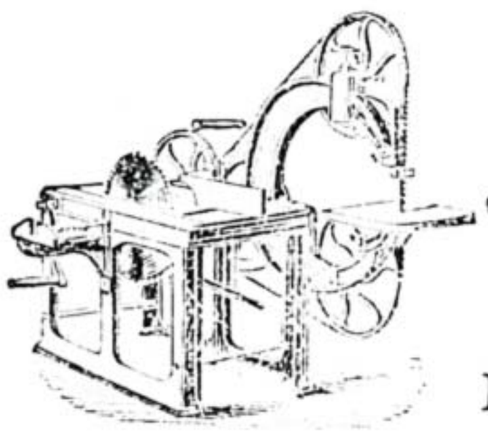

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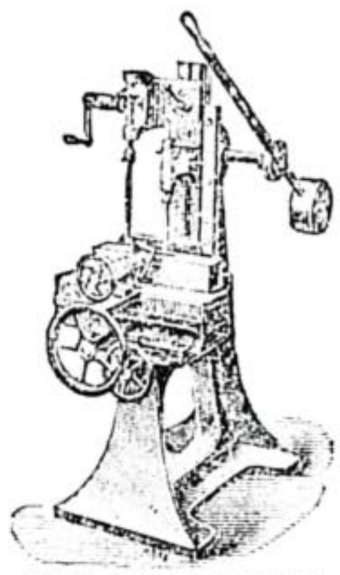

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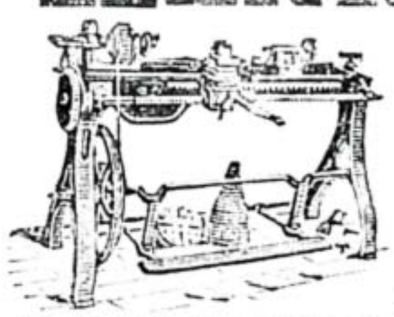

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